ELECTROCARDIOGRAPHIC TEST BOOK

EDITOR

Travis Winsor

ADVISORY AND REVIEW PANEL

Richard Ashman
Joseph M Barker
S Gilbert Blount
Howard B Burchell
J Scott Butterworth
E Grey Dimond
Emanuel Goldberger
Robert P Grant
Ashton Graybiel
Hans H Hecht
Franklin D Johnston
Albert A Kattus
Eugene Lepeschkin
Richard H Lyons
G W Manning
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Gordon B Myers
Gertrude Nicolson
Reno R Porter
Myron Prinzmetal
Francis F Rosenbaum
Ernst Simonson
Sidney S Sobin
Maurice Sokolow
Conger Williams
Louis Wolff
Paul N Yu
Robert F Ziegler

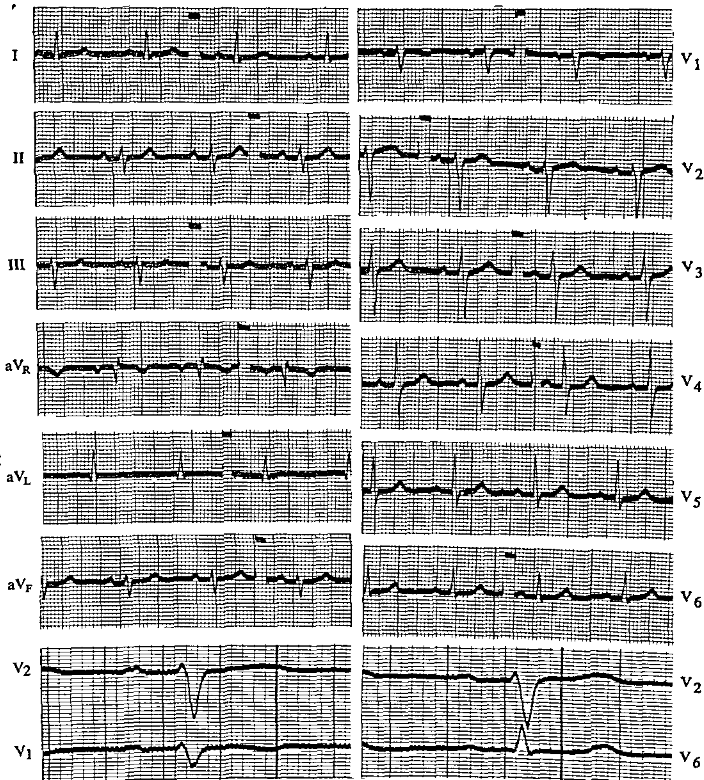
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VOLUME I

PART A

ELECTROCARDIOGRAMS

70 YEAR OLD FEMALE NO CHEST PRESSURE OR PAIN CARDIAC CHECK UP NO DRUGS



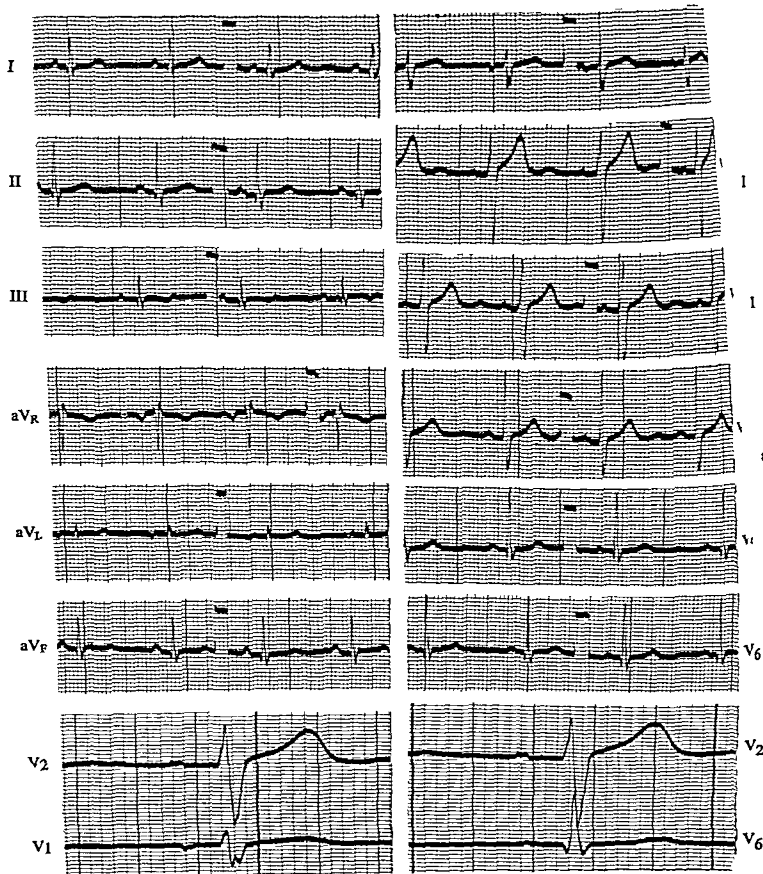
I The electrocardiographic position of the heart is

A vertical
B semi vertical
C intermediate
D semihorizontal
E horizontal
F indeterminate

II The electric axis of the QRS complexes is deviated somewhat to the

A left
B right

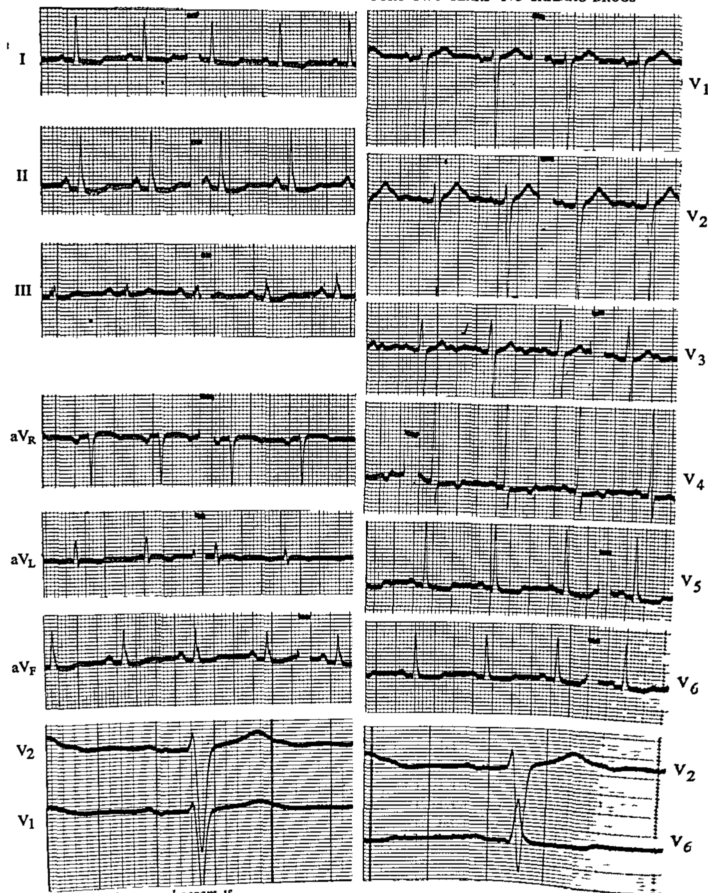
58 YEAR OLD FEMALE NO CARDIAC COMPLAINTS NO DRUGS



The rhythm is

- A sinus bradycardia
- B nodal rhythm with retrograde conduction
- C normal sinus rhythm
- D sinus arrhythmia

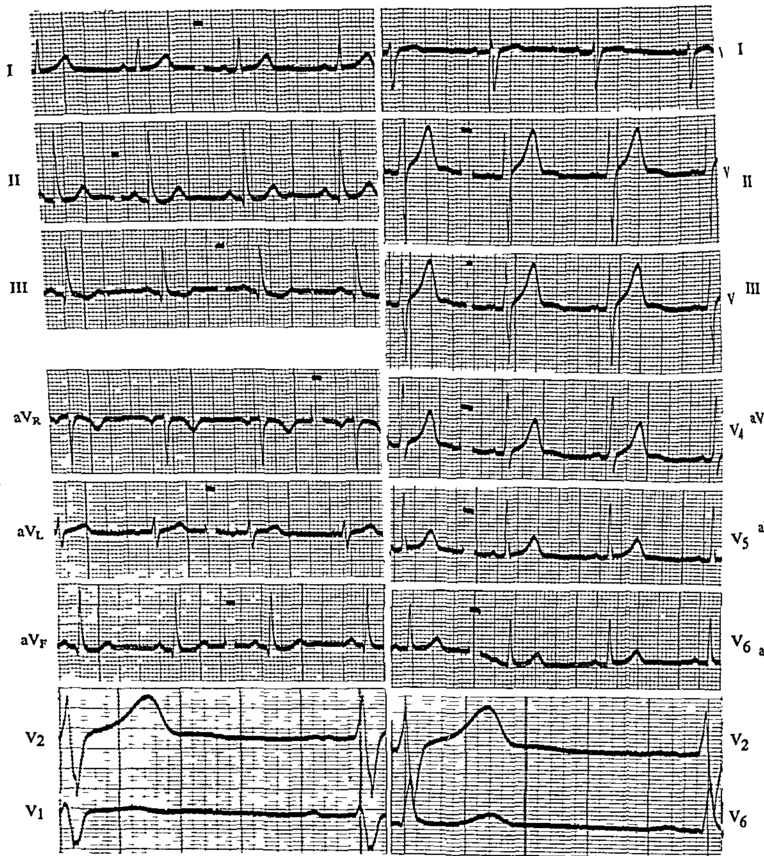
58 YEAR OLD MALE CHEST PAIN ON EFFORT TWO YEARS NO CARDIAC DRUGS



The electrocardiogram is

A normal
B diagnostic of a myocardial infarct
C consistent with myocardial injury and/or ischemia
D diagnostic of hypokalemia

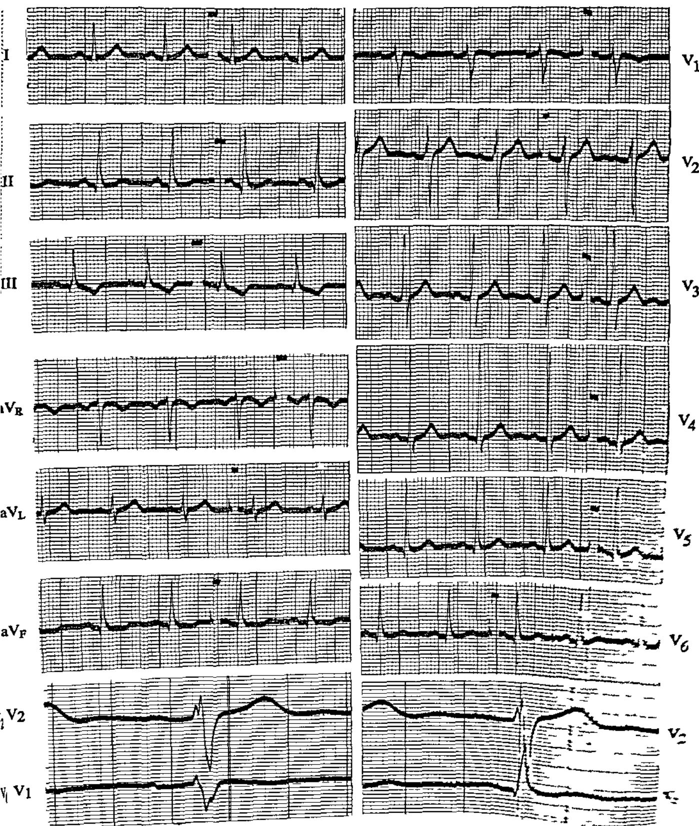
45 YEAR OLD MALE NO DRUGS



The electrocardiogram is

A entirely normal
B abnormal because of tall T waves in leads V_2 and V_3
C abnormal because of the notched P waves in lead V_2
D abnormal because of sagging of the S T segments in lead aV_F

47 YEAR OLD MALE CHEST PAIN NO CARDIAC DRUGS



The tracing is

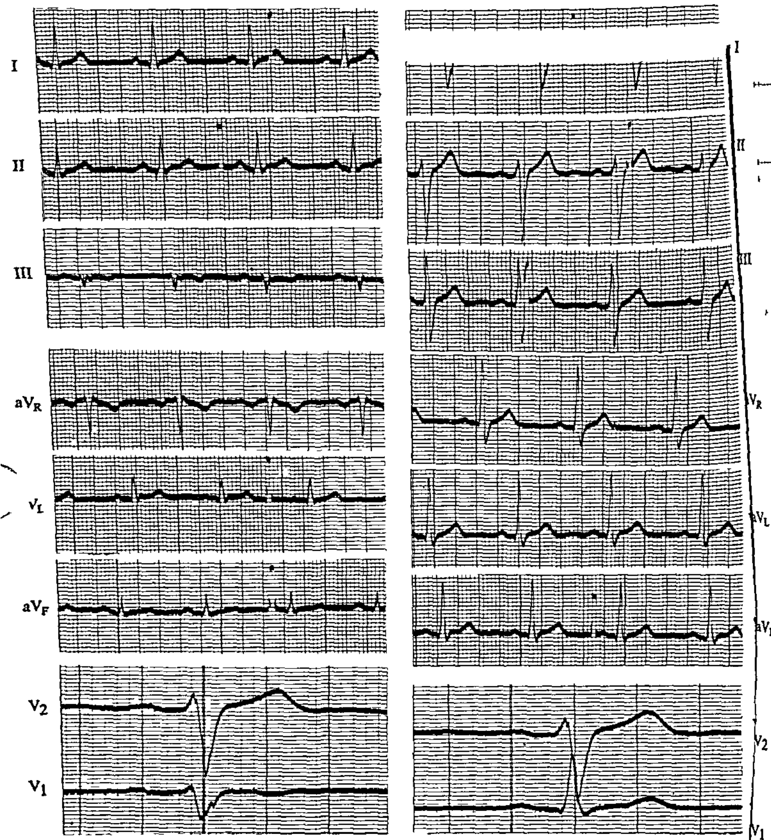
A entirely normal

B in keeping with posterior myocardial injury or ischemia

C indicative of anterior myocardial infarction

D diagnosis of left ventricular hypertrophy

42 YEAR OLD MALE LEG PAINS ONE YEAR NO DRUGS



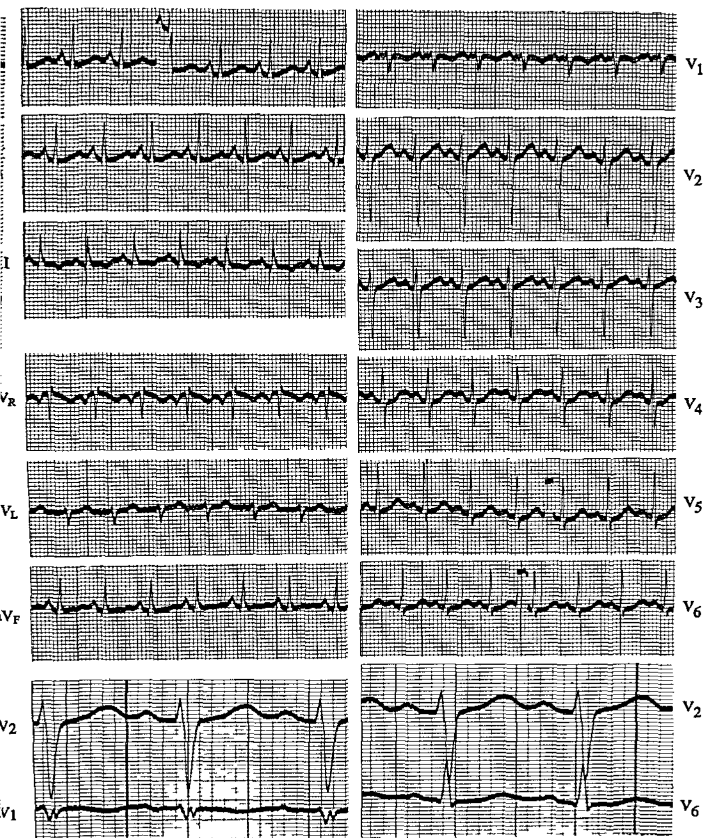
I The electrocardiographic position of the heart is

A horizontal
B semi horizontal
C intermediate
D vertical
E semi vertical
F indeterminate

II The QRS complexes are

A of normal width
B abnormally narrow
C abnormally wide

13 YEAR OLD WHITE FEMALE LOUD HEART MURMUR SINCE BIRTH NO CARDIAC DRUGS



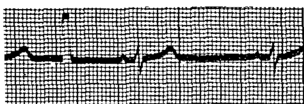
I The following is present

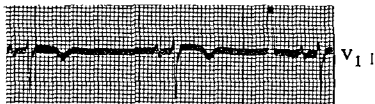
- A sinus arrhythmia
- B sinus tachycardia
- C nodal tachycardia
- D atrial tachycardia

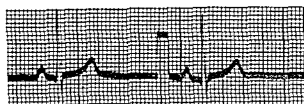
II The negative S T segment shifts in lead V_4 *are*

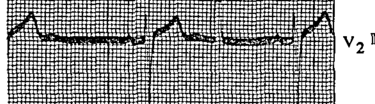
- A diagnostic of disease
- B probably secondary to the rapid rate
- C indicative of pericarditis

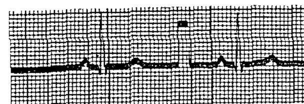
AR OLD WHITE MALE TEN MILE MARATHON RUNNER NO CARDIAC COMPLAINTS NO DRUGS

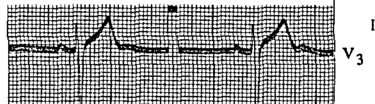


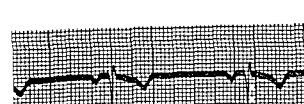


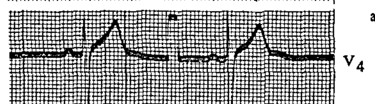


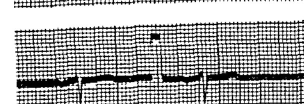


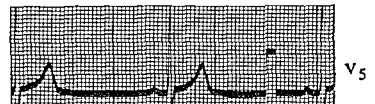


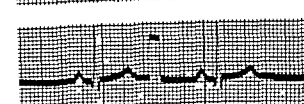


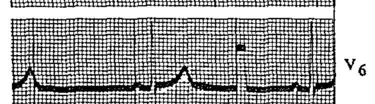


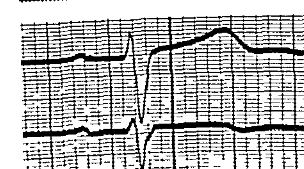


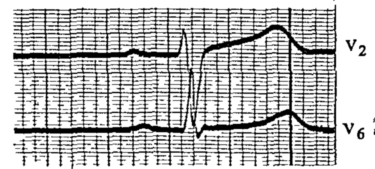












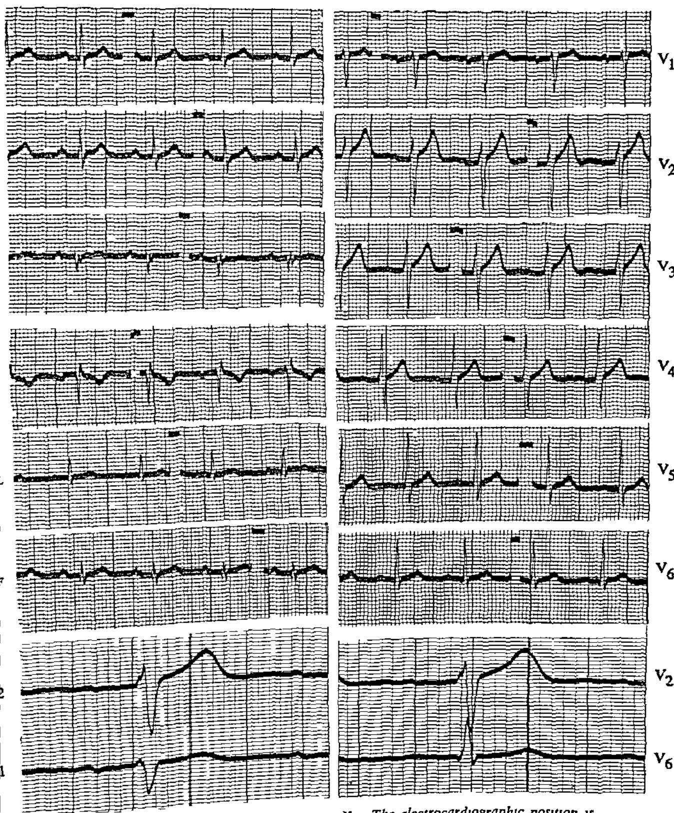
The following is present

A normal sinus rhythm
B sinus bradycardia,
C sino-atrial block
D sinus arrest

II The electrocardiographic position of the heart is

A horizontal
B intermediate
C vertical

54 YEAR OLD MALE CHEST PAIN ONE YEAR NO CARDIAC DRUGS



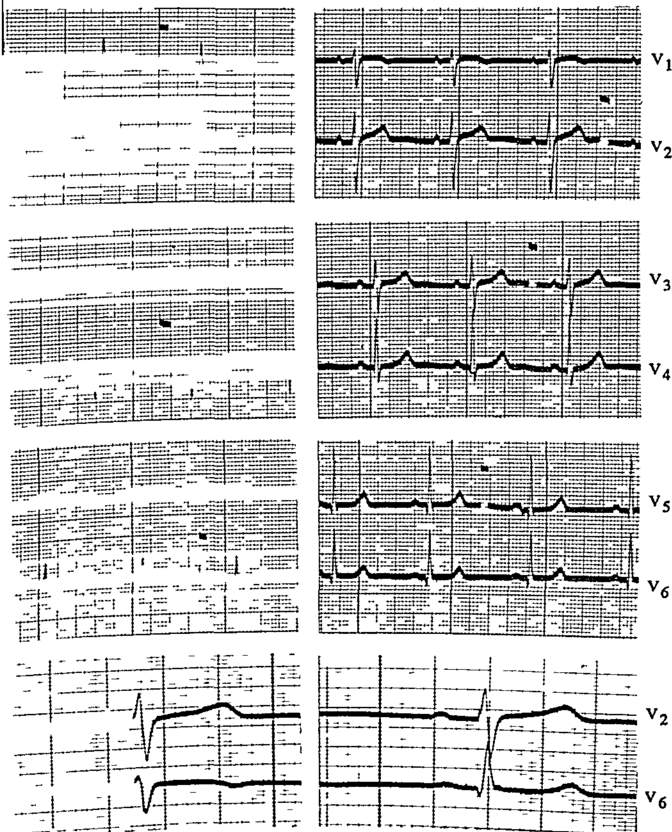
I The tracing is

A normal
B suggestive of cardiac disease
C abnormal

II The electrocardiographic position is

A horizontal
B semi horizontal
C intermediate
D vertical
E semi vertical
F indeterminate

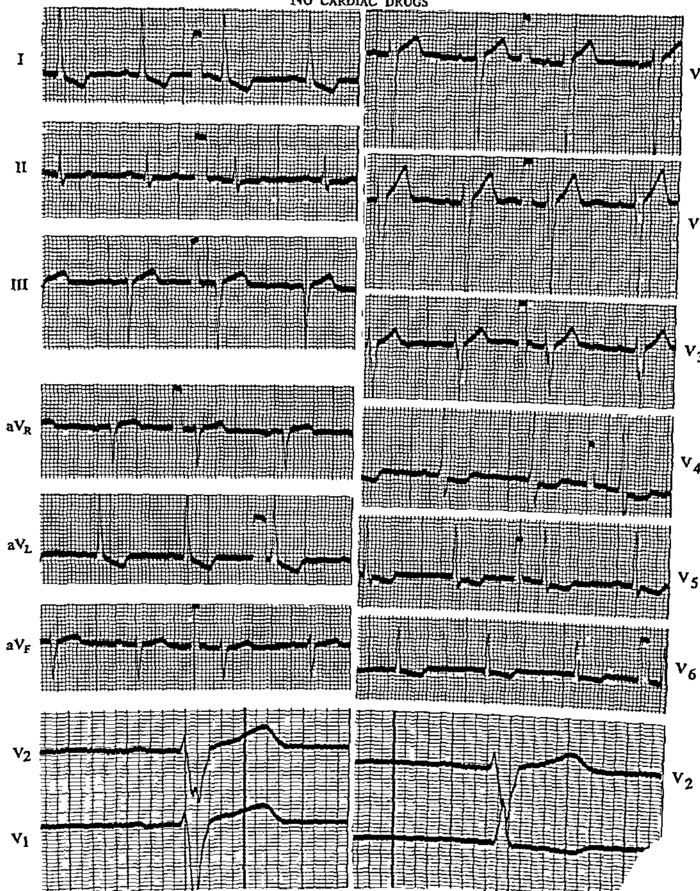
55 YEAR OLD FEMALE COMPLAINS OF YELLOW TUMORS ON EYELIDS



The Q waves in lead aV_F *are strongly suggestive of*

- A an old posterior myocardial infarct
- B strong counterclockwise rotation of the heart about the long axis as viewed from the apex
- C normal ventricular depolarization
- D pulmonary infarction

55 YEAR OLD MALE CHECK UP SIX MONTHS AFTER ATTACK OF PULMONARY EDEMA
NO CARDIAC DRUGS



The electrocardiogram is typical of

A right and left ventricular hypertrophy

B left ventricular hypertrophy ✓

C a complete left bundle branch block

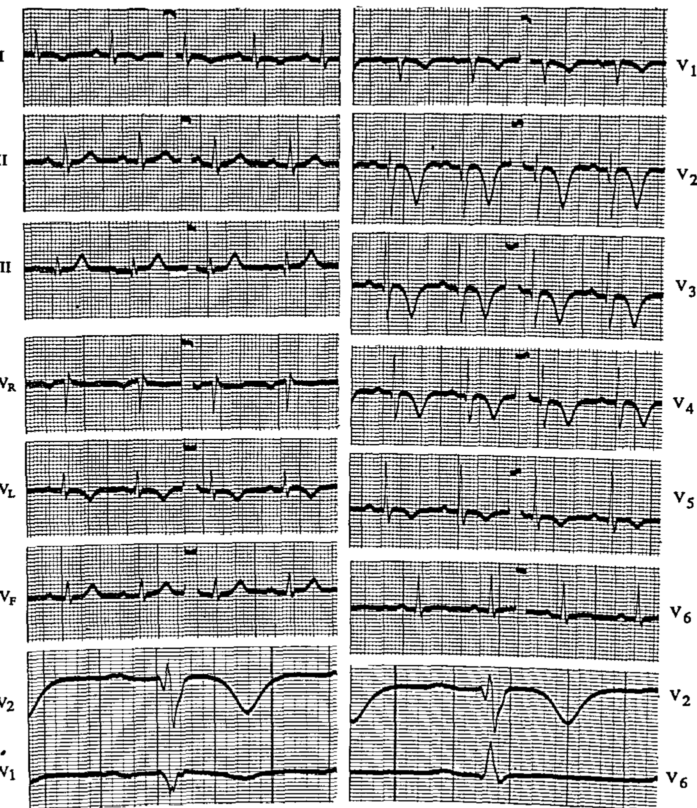
AR OLD WHITE FEMALE SUBSTERNAL PAIN RADIATING INTO JAWS, SIX HOURS NO DRUGS



The electrocardiogram

A is entirely normal
B is strongly suggestive of chronic pericarditis
C is suggestive of subendocardial injury or ischemia
D indicates abnormally late depolarization of the left ventricle

57 YEAR OLD MALE CRUSHING PRECORDIAL PAIN FOR SIX HOURS TWELVE DAYS AGO



The electrocardiogram

A indicates ischemia involving the subepicardial and anterolateral aspect of the left ventricle along with a small anteroseptal infarct

B indicates anterior myocardial ischemia and rules out an anterior infarct

C is typical of an acute subendocardial infarct

58 YEAR OLD FEMALE CHEST PAIN ON EFFORT NO CARDIAC DRUGS

V1

V2

V3

V4

V5

V6

V2

V6

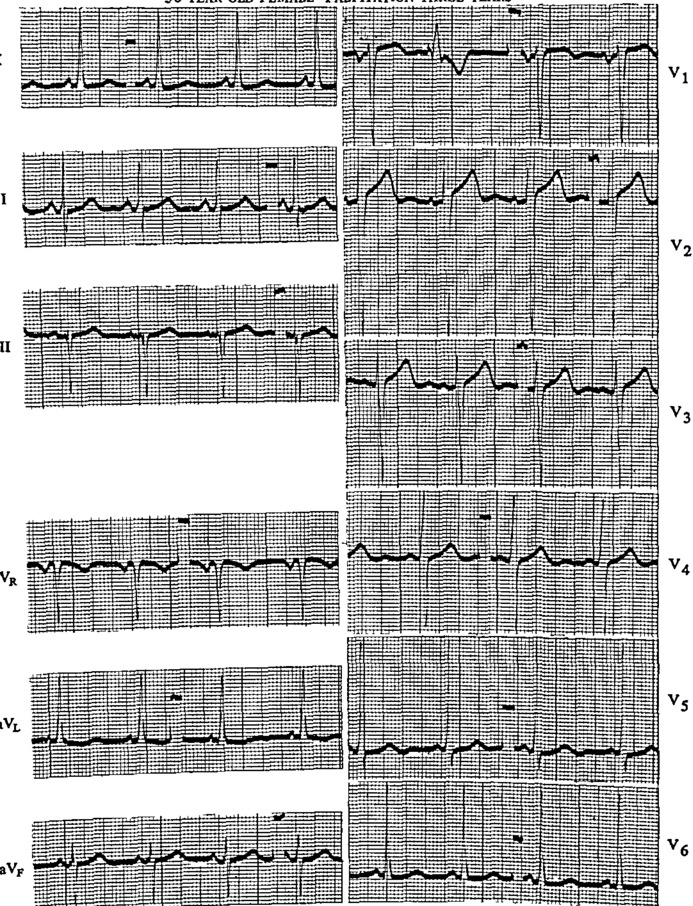
I The voltages of the QRS complexes in the standard leads

A tend to be low
B are near or are above average
C are tall

II The QRS complexes are

A of normal width
B abnormally wide
C abnormally narrow

50 YEAR OLD FEMALE PALPITATION THREE YEARS



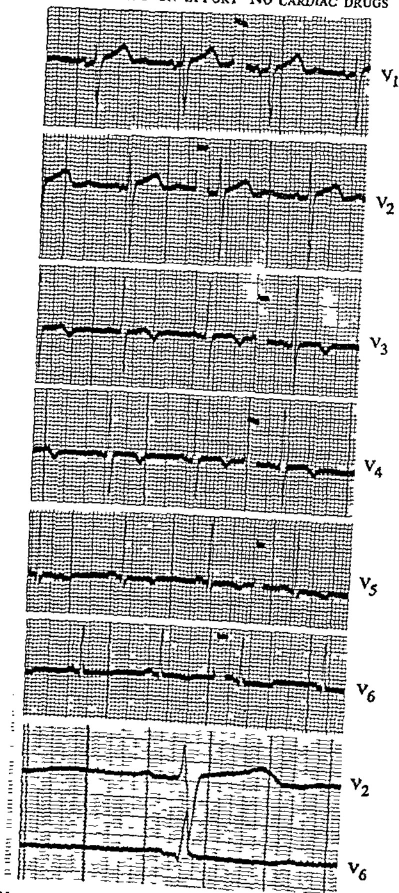
I The following is present

A left ventricular hypertrophy
B right and left ventricular hypertrophy
C an incomplete left bundle branch block
D a false bundle branch block

II The following is present

A a ventricular ectopic beat
B a nodal ectopic beat
C premature contraction

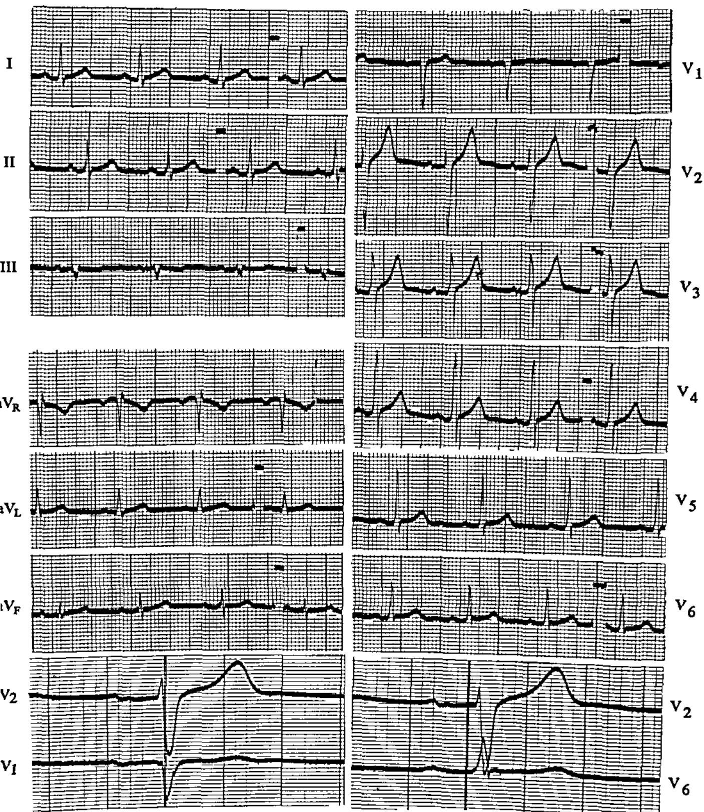
AR OLD MALE EPIGASTRIC DISTRESS ON LYING DOWN AND ON EFFORT NO CARDIAC DRUGS



The inverted T waves in leads V_3 V_4 and V_5 are

A definite evidence of coronary artery disease
B consistent with ischemia of the anterolateral aspect of the left ventricle
C diagnostic of a myocardial infarct

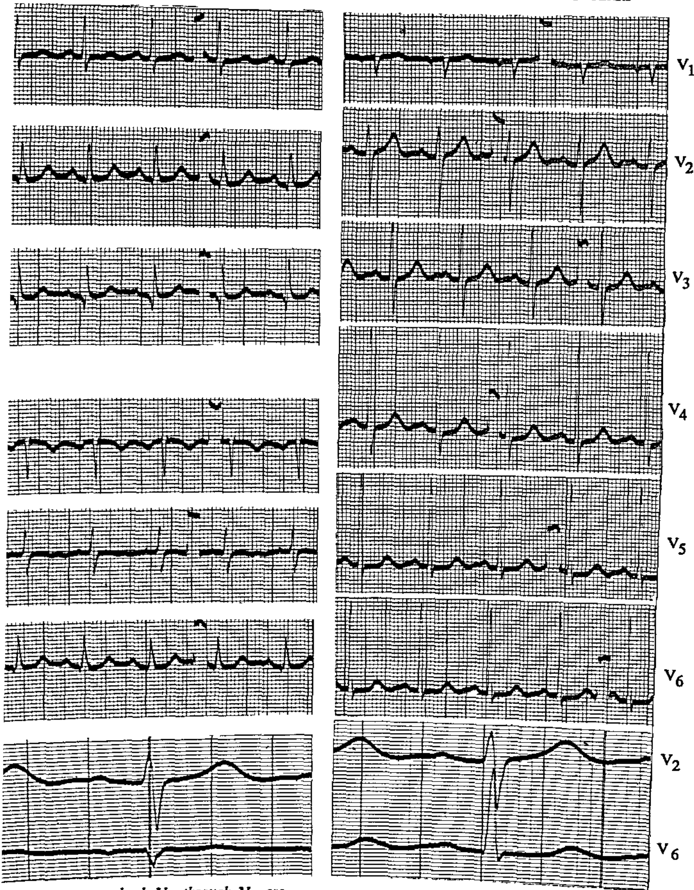
41 YEAR OLD MALE HEART ATTACK TWELVE MONTHS AGO NO CARDIAC DRUGS



The electrocardiogram is

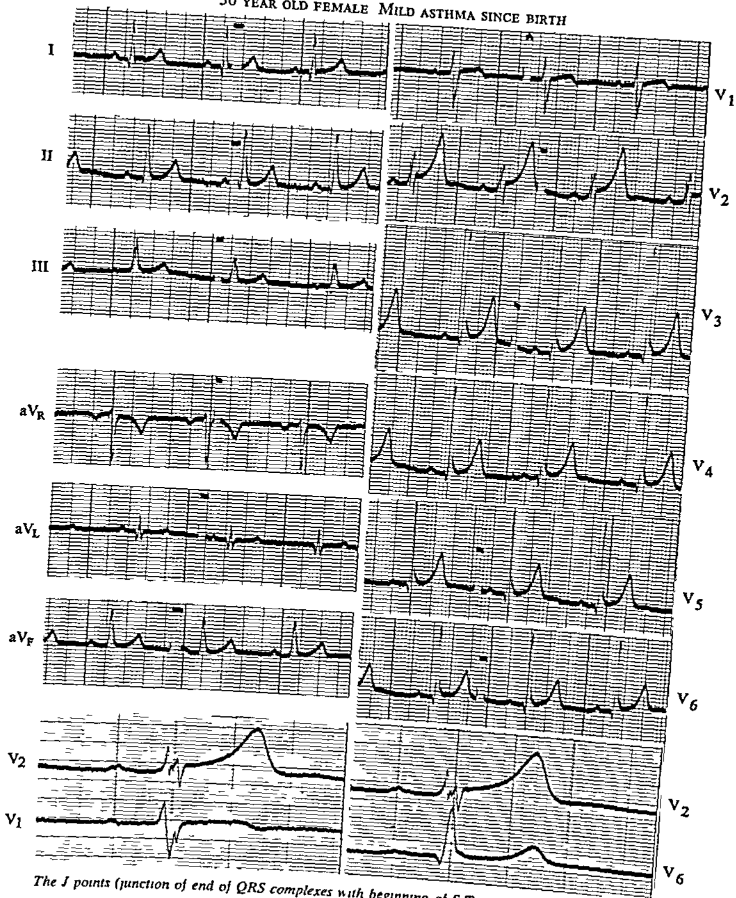
A normal and rules out cardiac disease
B normal however cardiac disease may be present
C abnormal

60 YEAR OLD FEMALE STROKE TWO YEARS AGO HYPERTENSION TWENTY YEARS



The P waves in leads V_2 through V_6 are

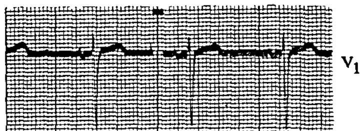
A abnormally wide
B appear wide because of the presence of U waves
C suggest the presence of mitral stenosis
D suggest right atrial enlargement

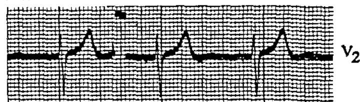


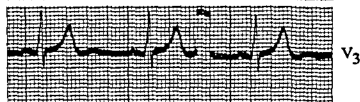
The J points (junction of end of QRS complexes with beginning of S T segments) in lead V_2 are

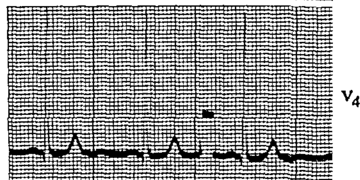
A indicative of cardiac disease
B indicative of pericarditis
C indicative of an electrolyte disturbance
D probably normal

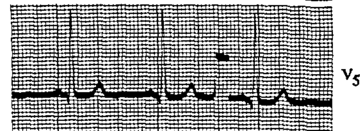
71 YEAR OLD FEMALE HEADACHES FIVE YEARS NO CARDIAC DRUGS

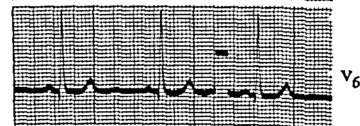


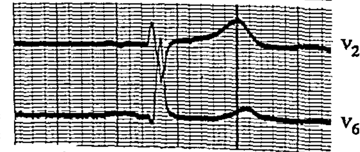












I *The voltage of the R waves in lead* V_4 *is*

A low
B normal
C high

II *The tracing suggests*

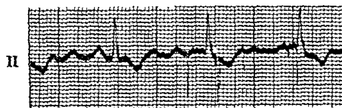
A right ventricular hypertrophy
B left ventricular hypertrophy
C no ventricular hypertrophy

68 YEAR OLD MALE HYPERTENSION FOR YEARS NO SYMPTOMS DIGITALIS LEAF 0 2 GM DAILY

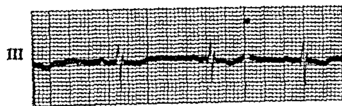
I



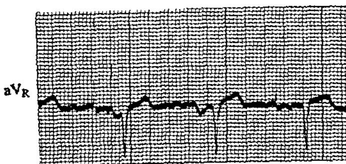
II



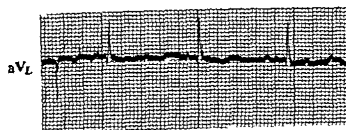
III



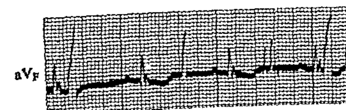
aV_R

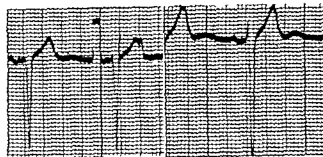


aV_L

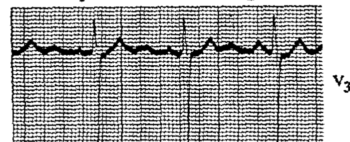


aV_F

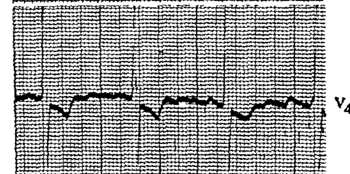




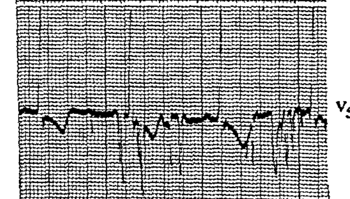
V_1 V_2



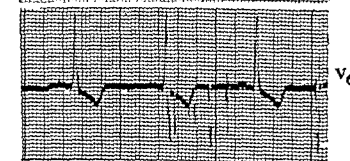
V_3



V_4



V_5



V_6

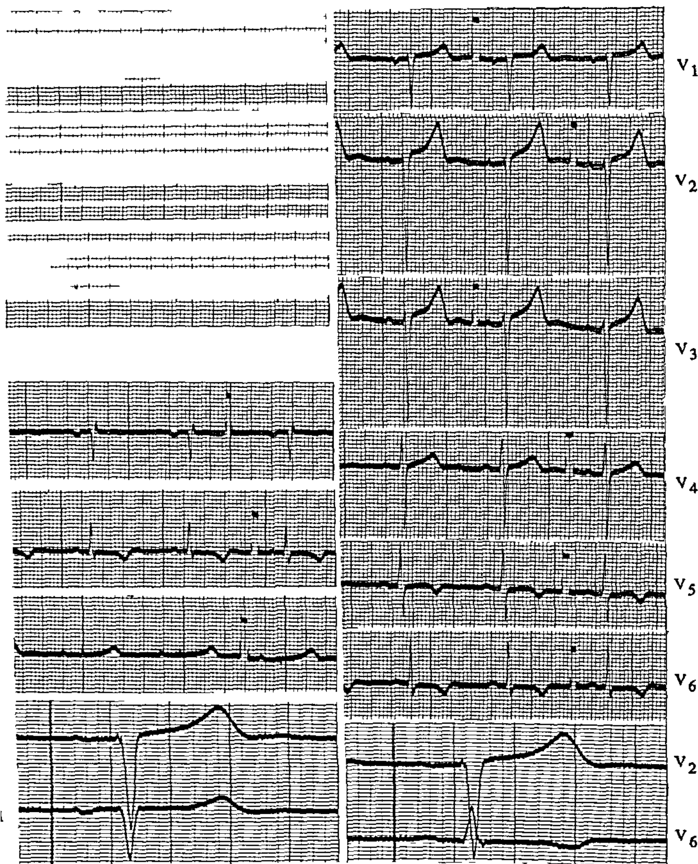
I The tracing shows the following

- A a lead is mounted upside down
- B there was movement of the electrode on the skin
- C there was a loose electric connection

II There is evidence of

- A right and left ventricular hypertrophy
- B right ventricular hypertrophy
- C left ventricular hypertrophy

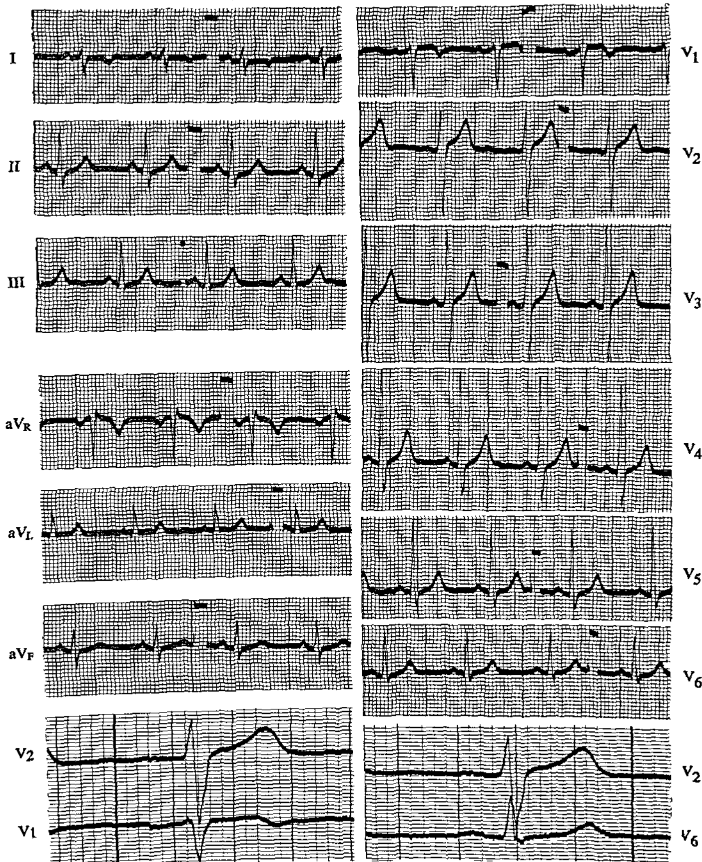
67 YEAR OLD WHITE FEMALE SINGER DYSPNEA EIGHT MONTHS NO DIGITALIS



The electrocardiogram is

A normal
B in keeping with left ventricular hypertrophy with or without myocardial injury and ischemia
C strongly suggestive of pulmonary infarction

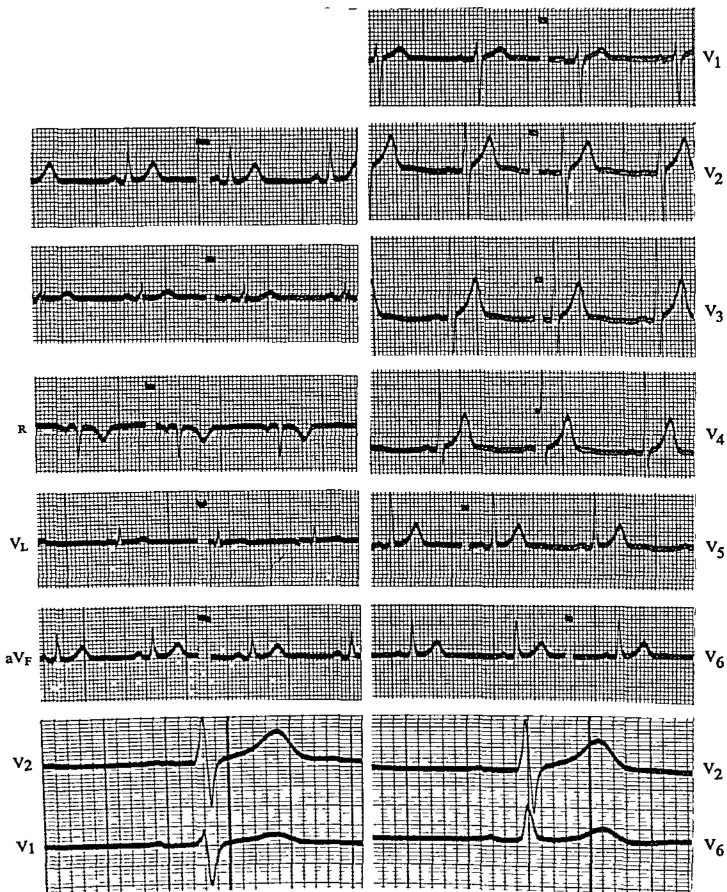
48 YEAR OLD KOREAN MALE CHECK UP NO CARDIAC DRUGS



The following artifact is present in the standard leads

A leads I and III were interchanged when mounted
B the right and left arm lead wires were switched when applied to the patient s limbs
C lead I is mounted upside down

58 YEAR OLD MALE CHECK UP



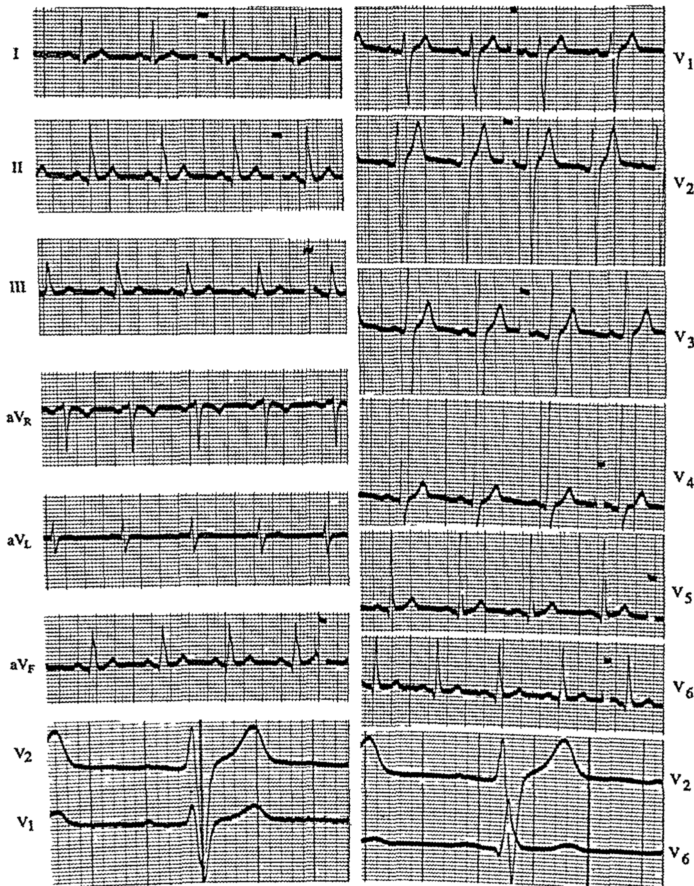
I The first portion of the QRS complexes in lead V_6 *is*

A large and positive
B isoelectric or slightly positive
C negative

II The transitional zone (QRS complexes) is at lead

A V_1
B V_2
C V_3
D V_4
E V_5

29 YEAR OLD MALE COLLAPSE FOLLOWING INTRAVENOUS INJECTION



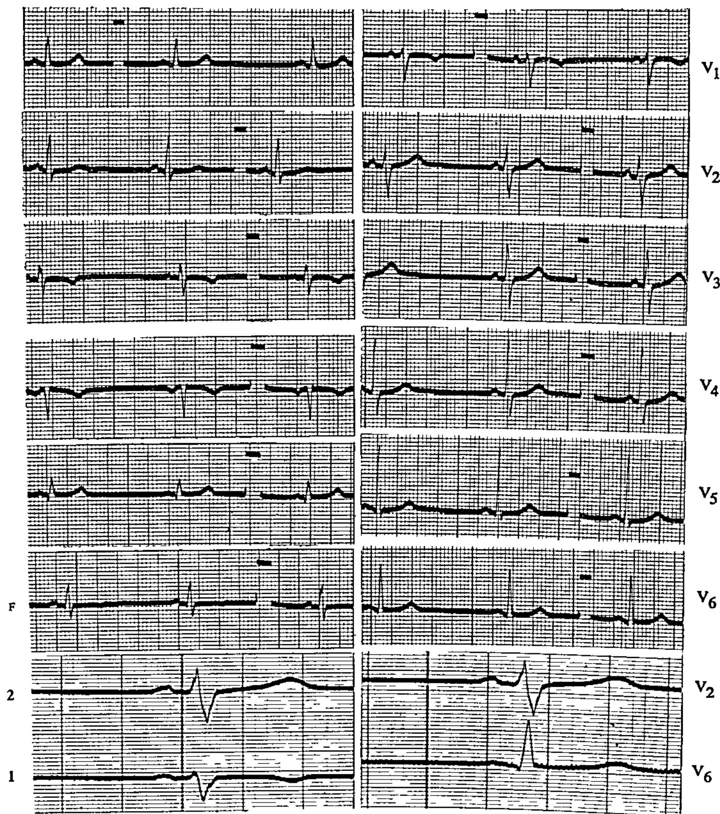
I The mean electric axis of the QRS complexes is

A deviated abnormally to the right
B deviated abnormally to the left
C within normal limits

II The tracing is

A definitely abnormal
B normal

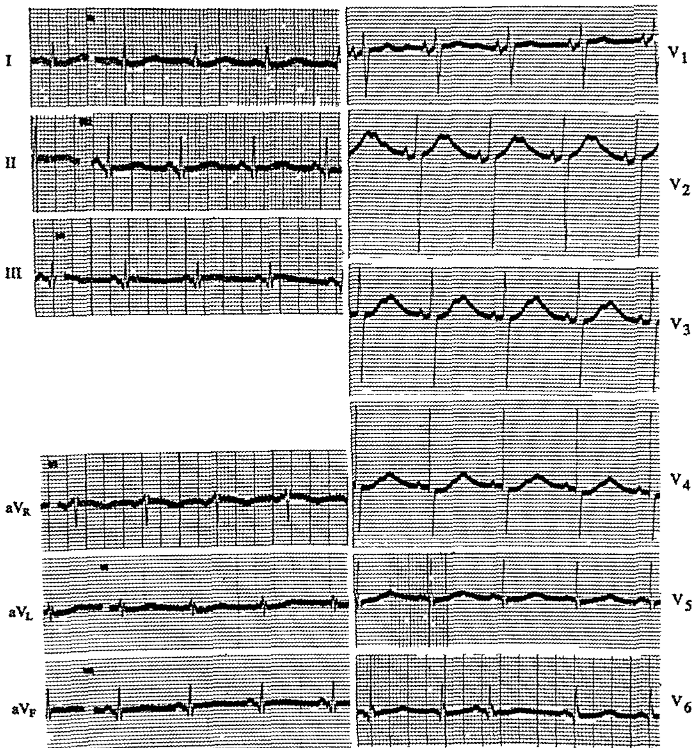
58 YEAR OLD FEMALE



A possible cause for the cardiac rhythm which is present is

A anemia
B anxiety
C hyperthyroidism
D infection
E epinephrine
F reserpine

48 YEAR OLD MALE ATTACKS OF RAPID HEART BEATING TAKING FOUR WHITE PILLS DAILY



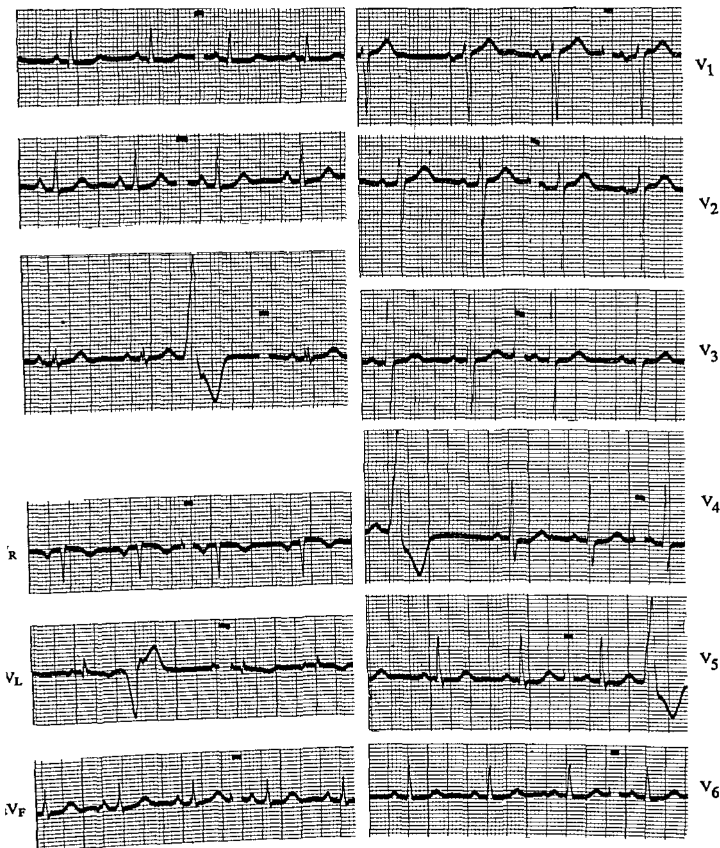
I The electrocardiogram suggests the following (select one)

A quinidine effect
B quinidine effect and muscle tremor in the limbs
C quinidine effect muscle tremor in the limbs and a loose connection to the lamp circuit in the electrocardiograph machine
D 60 cycle alternating current interference

II The electrocardiographic position of the heart is

A. horizontal
B semihorizontal
C intermediate
D vertical
E semivertical
F indeterminate

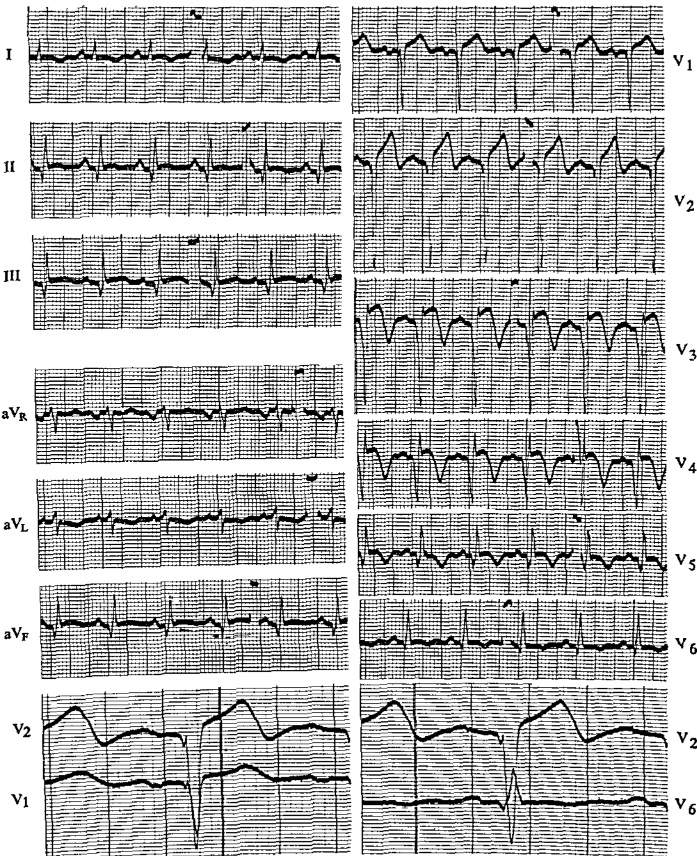
48 YEAR OLD MALE CHEST PAIN TWO MONTHS AGO NO CARDIAC DRUGS



The following is present

A atrial premature contractions with aberration
B ventricular premature contractions
C nodal premature contractions without retrograde conduction
D nodal premature contractions with retrograde conduction

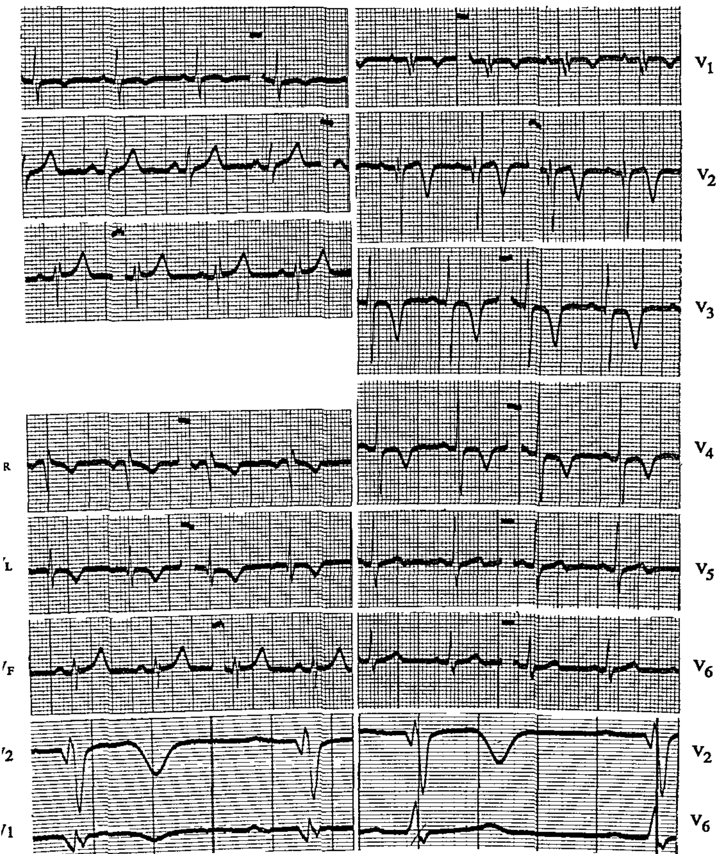
50 YEAR OLD MALE CHEST PAIN, SEVERE, LASTING TWENTY FOUR HOURS NO CARDIAC DRUGS



The tracing is typical of

A acute pericarditis
B an extensive subacute myocardial infarct
C pulmonary infarction
D myocardial ischemia without infarction

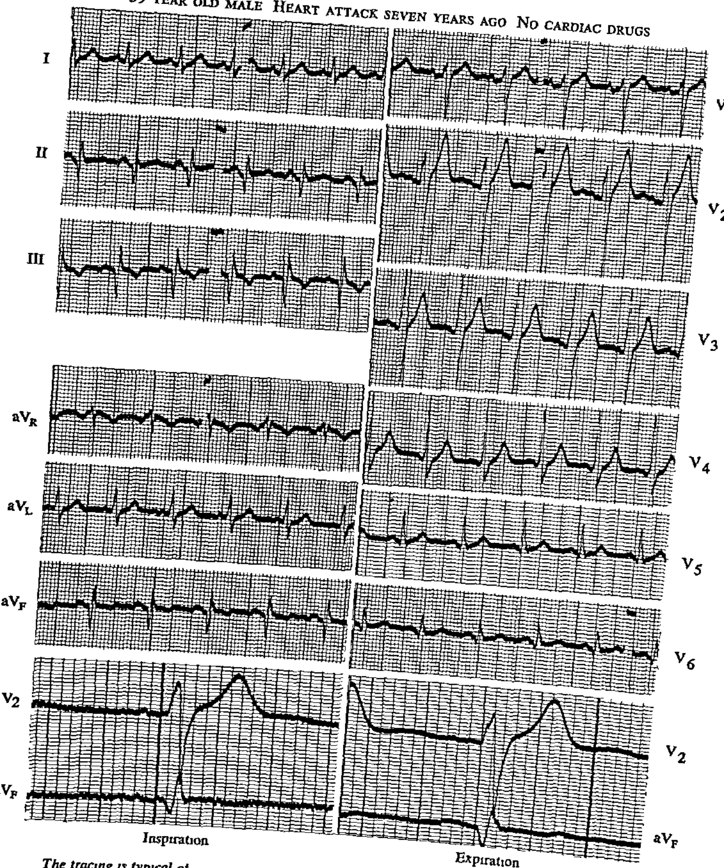
55 YEAR OLD MALE CHEST PAIN ONE WEEK AGO



An anteroseptal myocardial infarct is

A probable
B improbable
C ruled out
D certain

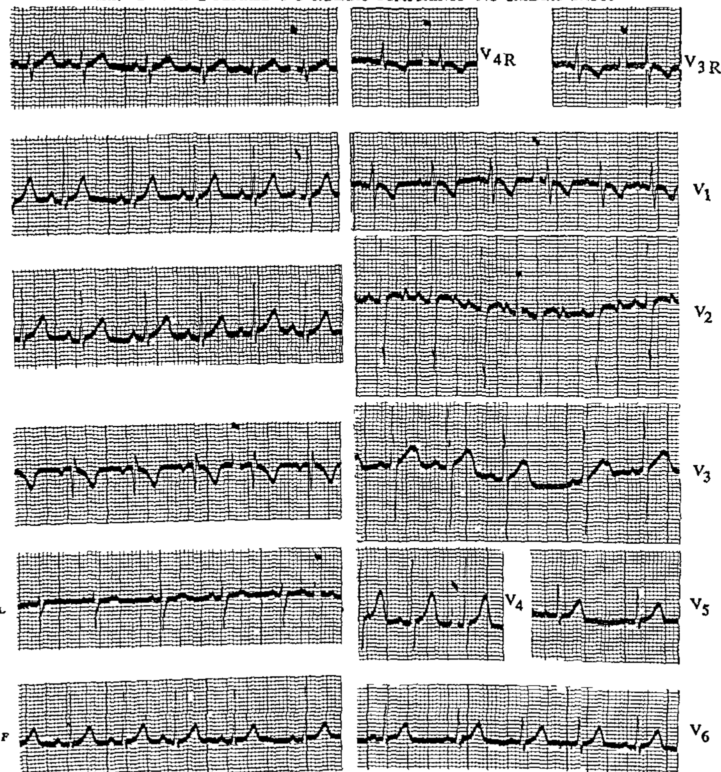
39 YEAR OLD MALE HEART ATTACK SEVEN YEARS AGO NO CARDIAC DRUGS



The tracing is typical of

A a high lateral myocardial infarct
B an old anterior myocardial infarct
C an old posterior myocardial infarct
D a normal intermediate electrocardiographic position

5 YEAR OLD WHITE FEMALE NO CARDIAC COMPLAINTS NO CARDIAC DRUGS



I The rhythm is

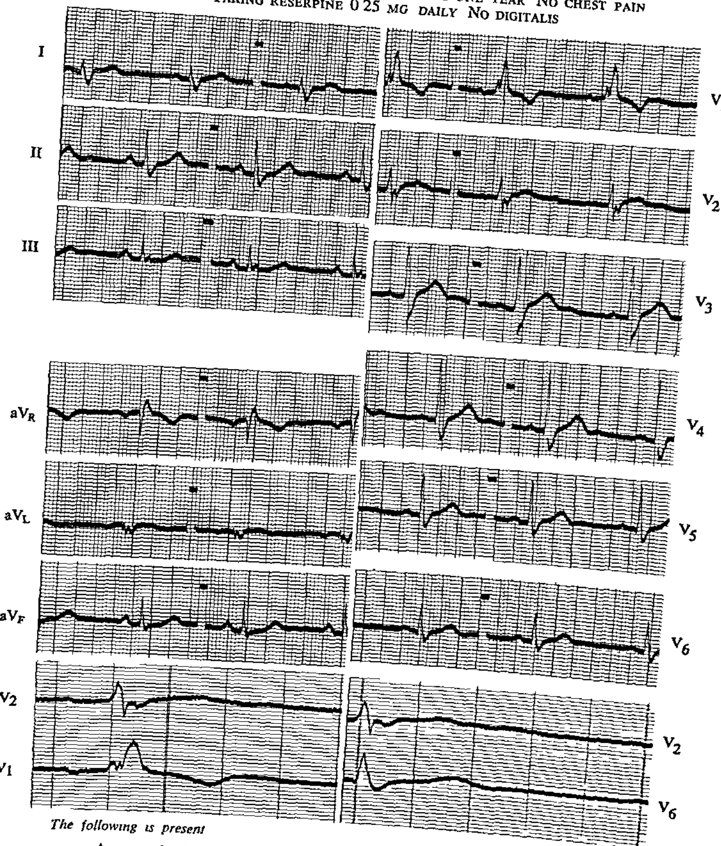
A sinus tachycardia
B sinus arrhythmia
C sinus bradycardia
D nodal rhythm with retrograde conduction

II The tracing

A indicates right ventricular hypertrophy which is pathologic
B is within normal limits
C indicates myocardial ischemia because of the inverted T waves in the precordial leads

III The wandering base line seen in leads V_2 and V_3 suggests

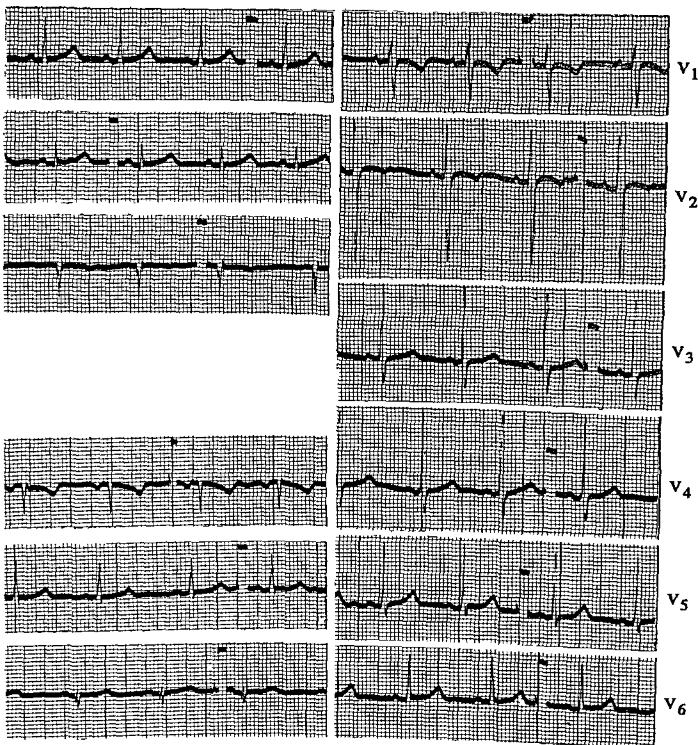
A a loose connection within the instrument or between a lead wire and the electrode
B movement of the electrode on the skin or polarization at an electrode
C 60 cycle interfering alternating current



The following is present

A sinus bradycardia and a right complete bundle branch block
B sinus bradycardia and a right incomplete bundle branch block
C normal sinus rhythm and a right complete bundle branch block
D a right complete bundle branch block and an anterior infarct

13 YEAR OLD FEMALE CARDIAC CHECK UP NO CARDIAC DRUGS



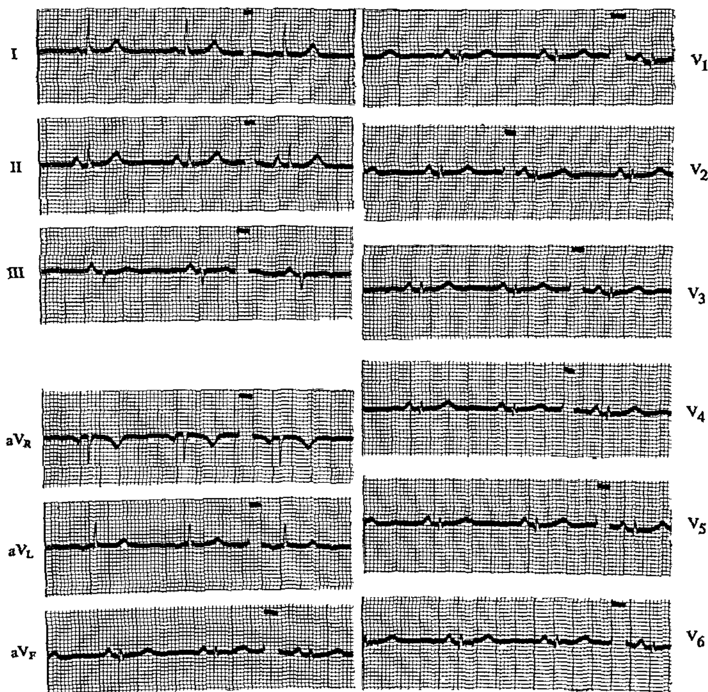
The following artifact is present

A switching of the lead I wires when the electrodes were applied to the right and left arms of the patient

B switching of the lead II wires when the right arm and left leg electrodes were applied to the patient

C switching of the lead III wires when the left arm and left leg electrodes were applied to the patient

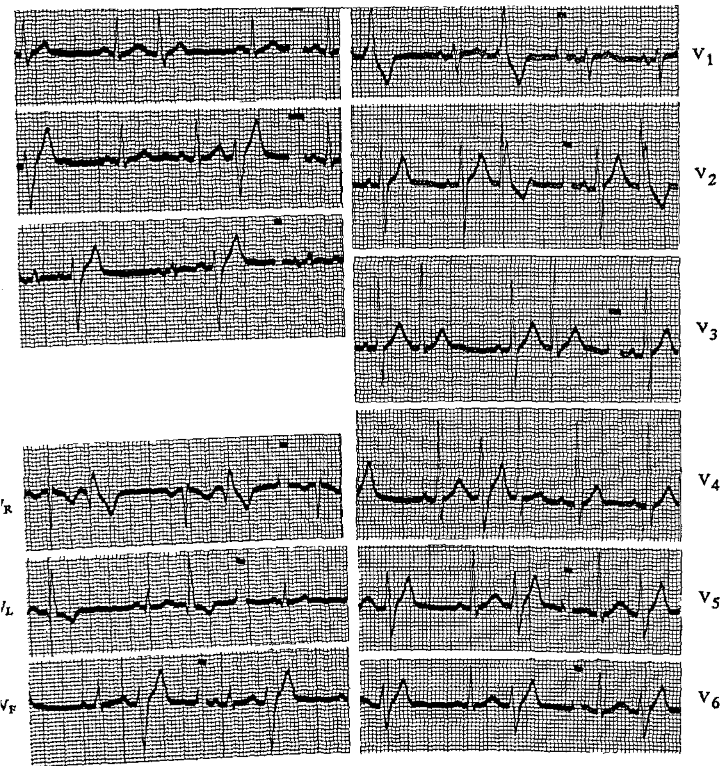
50 YEAR OLD WHITE FEMALE NO CARDIAC COMPLAINTS NO CARDIAC DRUGS



The following is present

A no artifact
B definite evidence of a posterior myocardial infarct
C an artifact involving some of the unipolar leads (V leads)
D nodal rhythm

58 YEAR OLD WHITE SALESMAN PALPITATION INTERMITTENTLY ONE YEAR NO DRUGS



The following is present

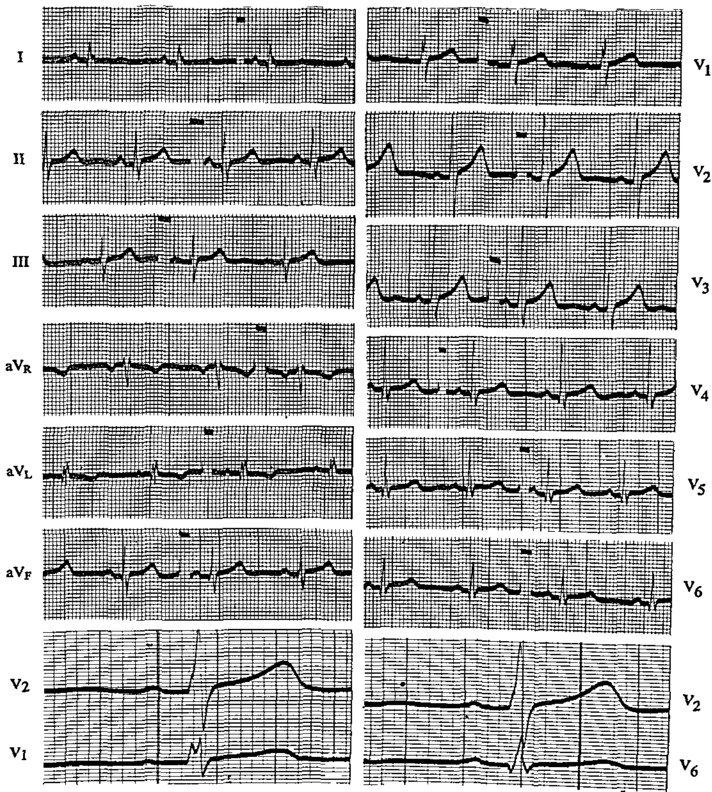
A atrial premature contractions with aberration of the QRS complexes

B multiple ventricular premature contractions

C multifocal ventricular premature contractions

D a paroxysmal left bundle branch block in the absence of premature atrial contractions

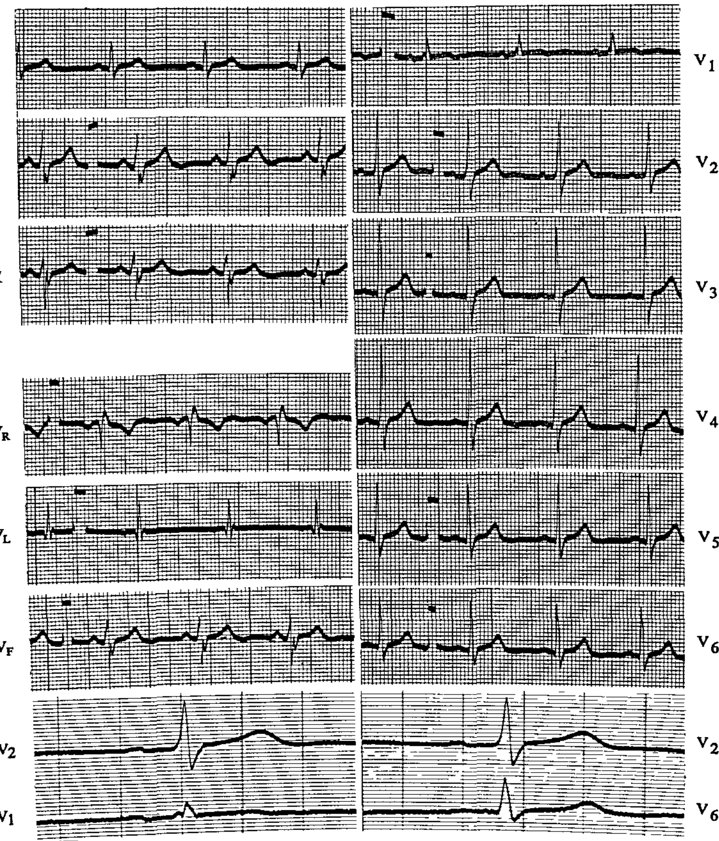
45 YEAR OLD FEMALE CHEST PAIN NINE MONTHS AGO NO CARDIAC DRUGS



The electrocardiogram

- A is diagnostic of a myocardial infarct
- B rules out a myocardial infarct
- C is in keeping with a diagnosis of a myocardial infarct

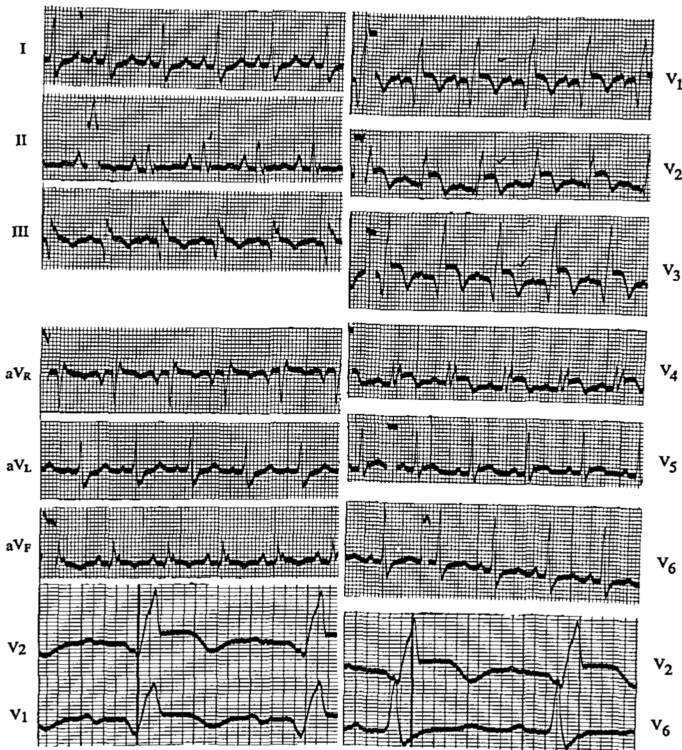
58 YEAR OLD MALE FULL FEELING IN HEAD FOR EIGHT MONTHS NO CARDIAC DRUGS



The tracing is in keeping with

A a complete right bundle branch block
B an incomplete right bundle branch block
C no cardiac disease
D an incomplete left bundle branch block

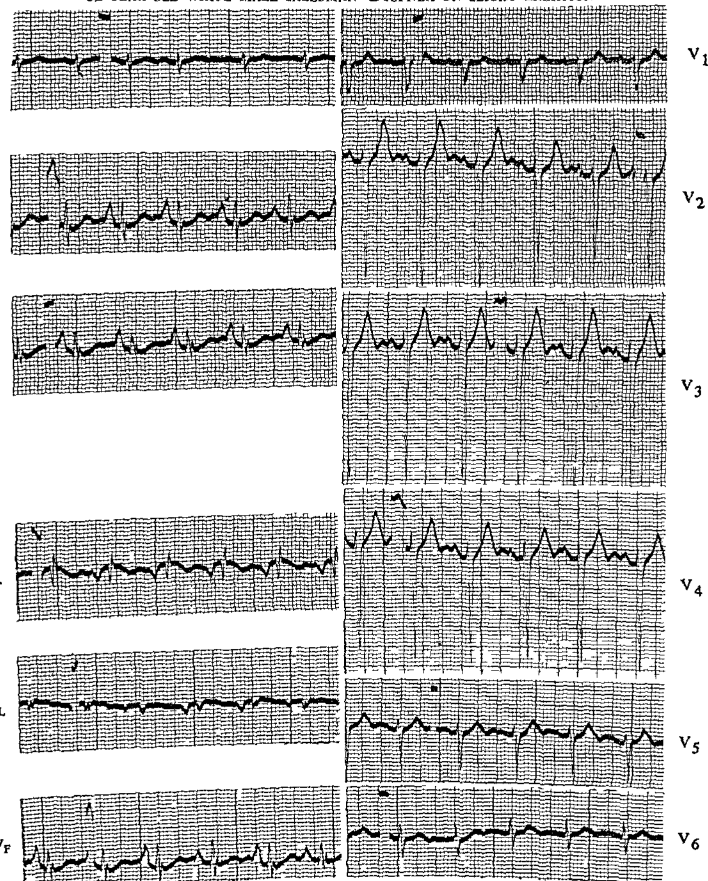
49 YEAR OLD WHITE MALE EXECUTIVE SEVERE SUBSTERNAL PAIN OF TWO DAYS DURATION



The following is present

- A a right incomplete bundle branch block
- B a right complete bundle branch block and a myocardial infarct
- C a right complete bundle branch block and left ventricular hypertrophy
- D a right complete bundle branch block and right ventricular hypertrophy

62 YEAR OLD WHITE MALE SALESMAN DYSPNEA ON SLIGHT EXERTION



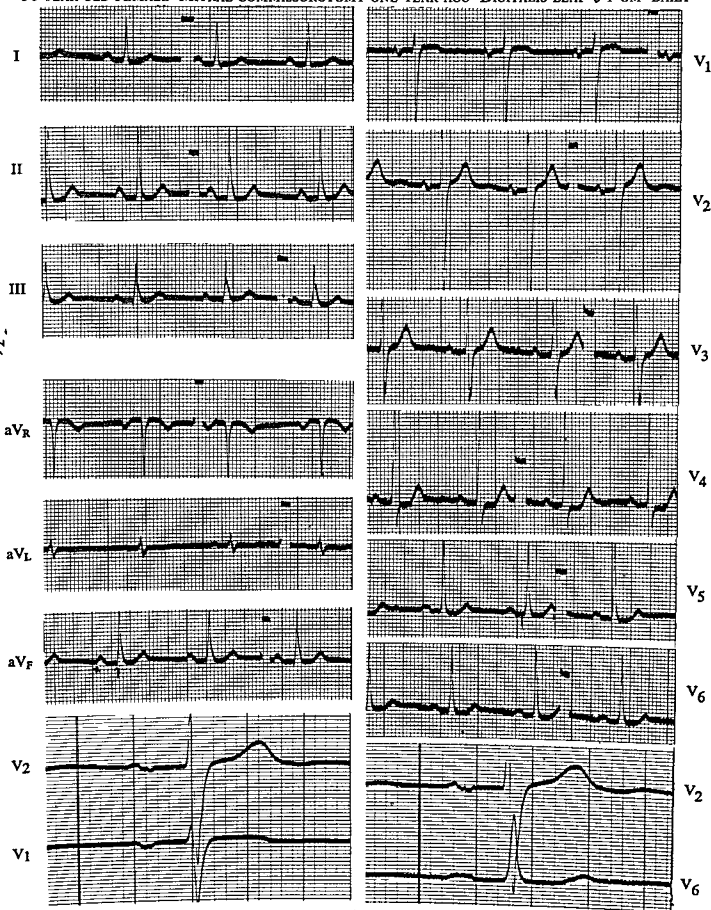
I The P wave picture is that of

A P mitrale
B P pulmonale
C normal atria

II The clinical conditions which produce tracings of this sort are

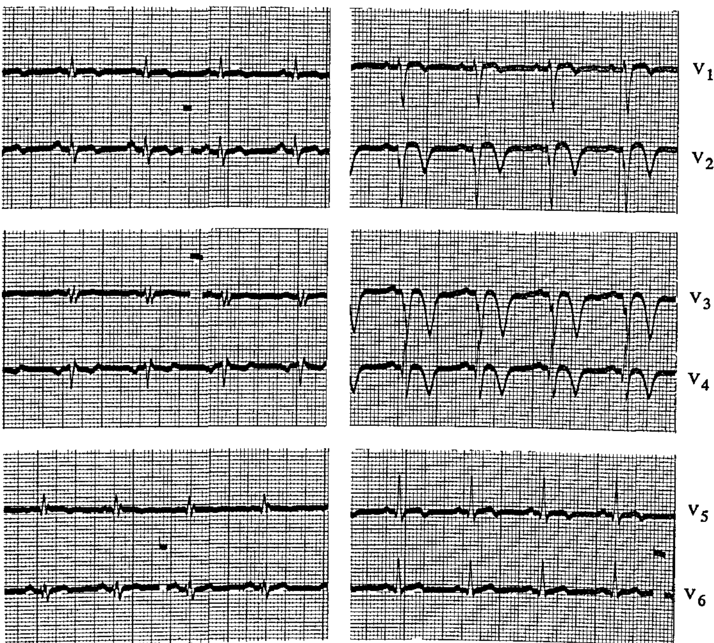
A acute cor pulmonale
B chronic cor pulmonale
C mitral stenosis

56 YEAR OLD FEMALE MITRAL COMMISSUROTOMY ONE YEAR AGO DIGITALIS LEAF 0 1 GM DAILY



The tracing
A rules out rheumatic mitral stenosis
B is in keeping with a digitalis effect
C suggests pericarditis

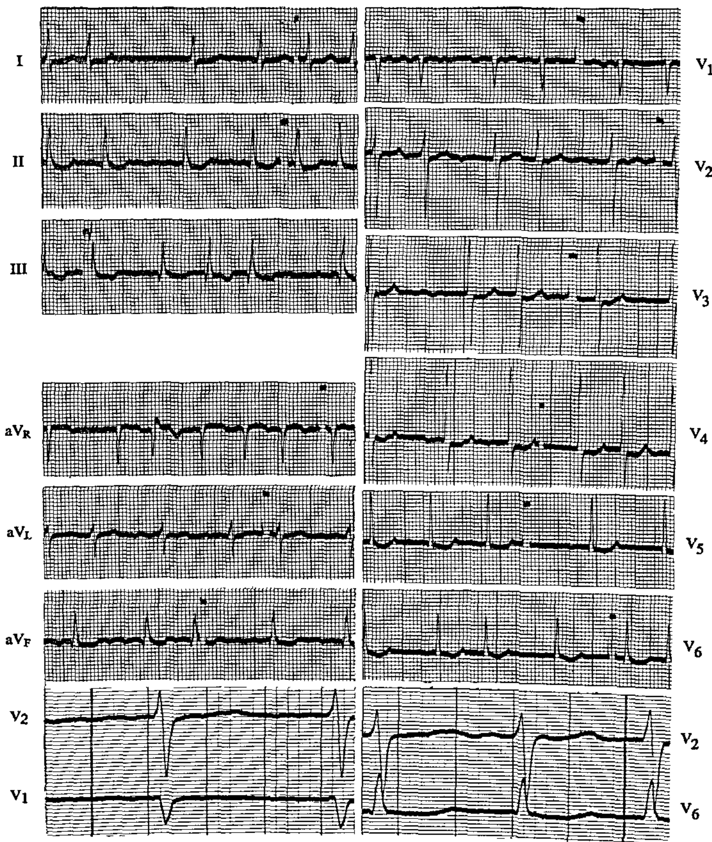
43 YEAR OLD MALE CHEST PAIN SEVEN WEEKS AGO



The tracing has the characteristics of

- A an acute (few hours) anterolateral myocardial infarct
- B a subacute or chronic anteroseptal myocardial infarct
- C anterior myocardial ischemia without infarction
- D an anterior and posterior myocardial infarct

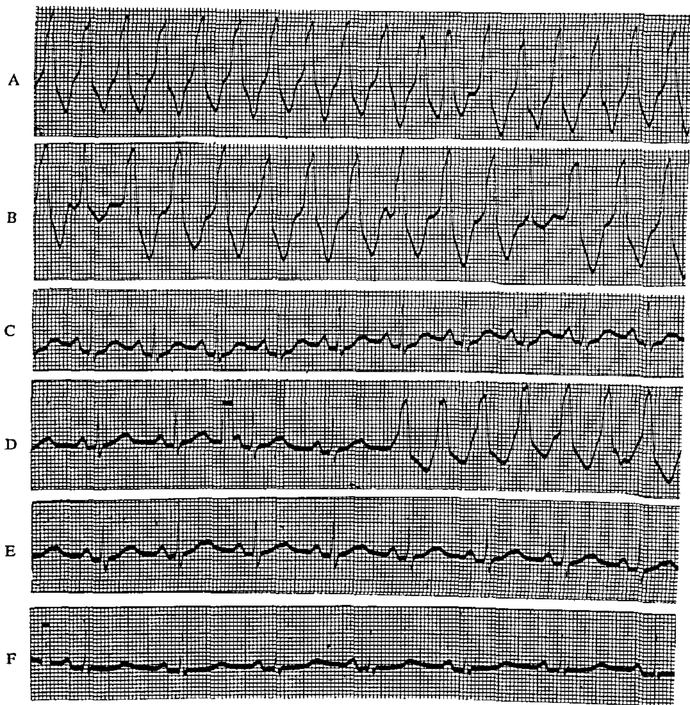
55 YEAR OLD FEMALE PALPITATION SIX MONTHS TAKING DIGITALIS DAILY



The tracing is most consistent with heart disease due to

A hyperthyroidism
B syphilis
C ventricular septal defect
D hypothyroidism

55 YEAR OLD MALE ATTACKS OF WEAKNESS, SWEATING AND PRECORDIAL PAIN INTERMITTENTLY FOR ONE YEAR ALL TRACINGS ARE LEAD II



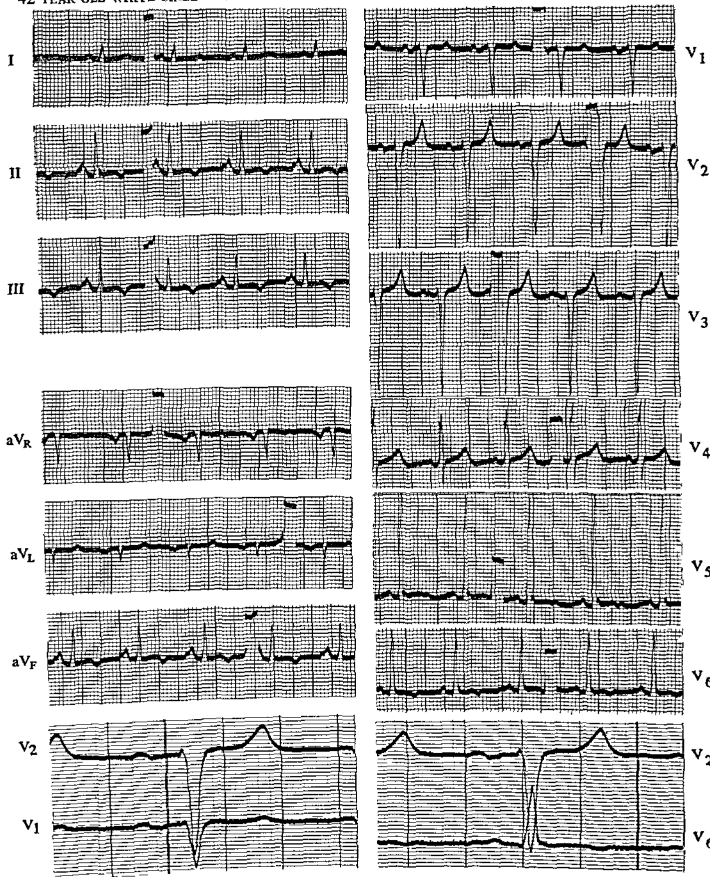
I The cardiac rhythm shown in tracing A is

- A ventricular fibrillation
- B ventricular flutter
- C ventricular tachycardia
- D anomalous atrioventricular conduction (Wolff Parkinson White)

II Tracing F shows a normal sinus rhythm and suggests

- A digitalis effect
- B hyperkalemia
- C hypercalcemia
- D quinidine

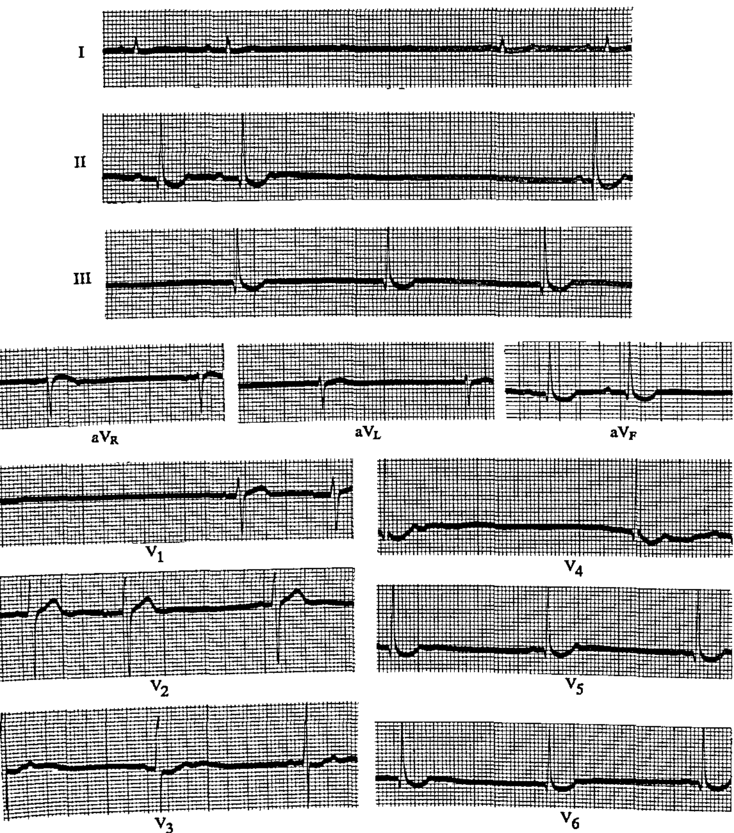
42 YEAR OLD WHITE MALE BOOKKEEPER LEFT CHEST PAIN ON EFFORT FOR TWENTY FIVE YEARS



The electrocardiogram is

A within normal limits
B diagnostic of coronary artery disease
C strongly suggestive of pulmonary embolus
D consistent with chronic adhesive or constrictive pericarditis

40 YEAR OLD WHITE FEMALE BLACK OUT SPELLS AND SHORTNESS OF BREATH
TAKING DIGITALIS, RESERPINE AND QUINIDINE RHEUMATIC FEVER AND CHOREA AS A CHILD



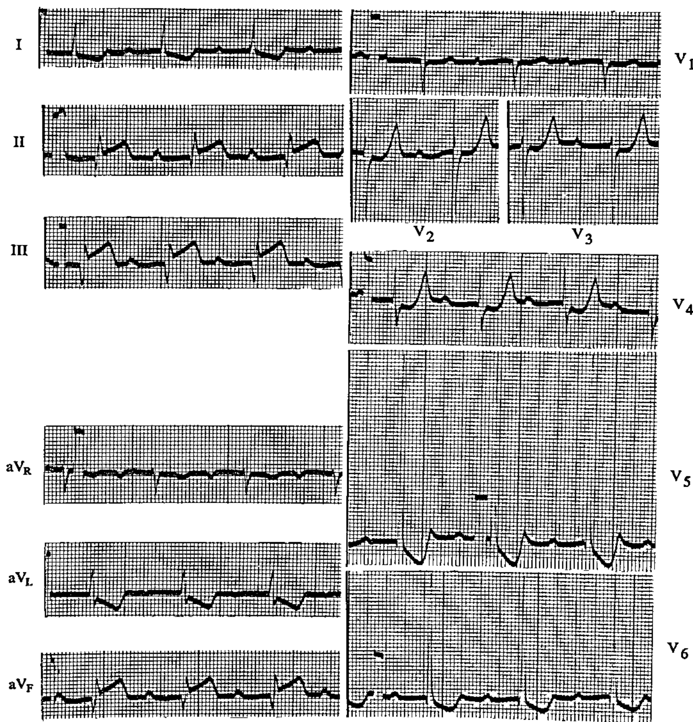
I The tracing shows

A periods of sinus arrest
B nodal bradycardia
C slow atrial fibrillation
D Wenckebach phenomena

II The tracing shows the effect of

A quinidine
B digitalis

54 YEAR OLD MALE WITH ACUTE CHEST PAIN STARTING TWO DAYS AGO WHICH LASTED 24 HOURS



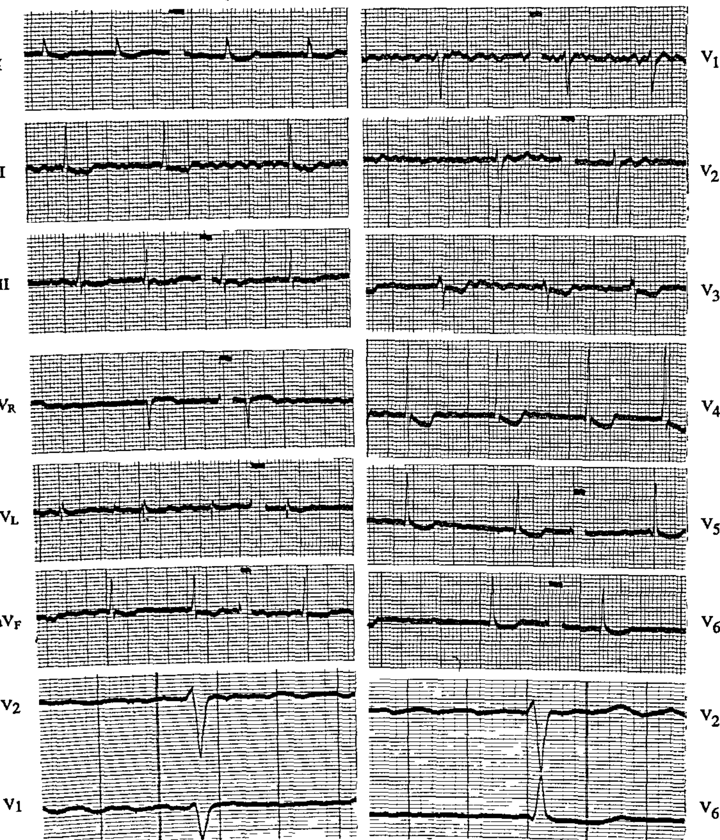
The following is present

A an incomplete AV block without dropped beats (first degree) without other abnormalities

B an incomplete AV block without dropped beats with an acute posterior myocardial infarct but without ventricular hypertrophy

C an incomplete AV block without dropped beats with an acute posterior myocardial infarct with left ventricular hypertrophy

62 YEAR OLD FEMALE SHORTNESS OF BREATH ON EXERTION DIGITALIS LEAF 0 1 GM DAILY AND QUINIDINE 0 2 GM THREE TIMES DAILY



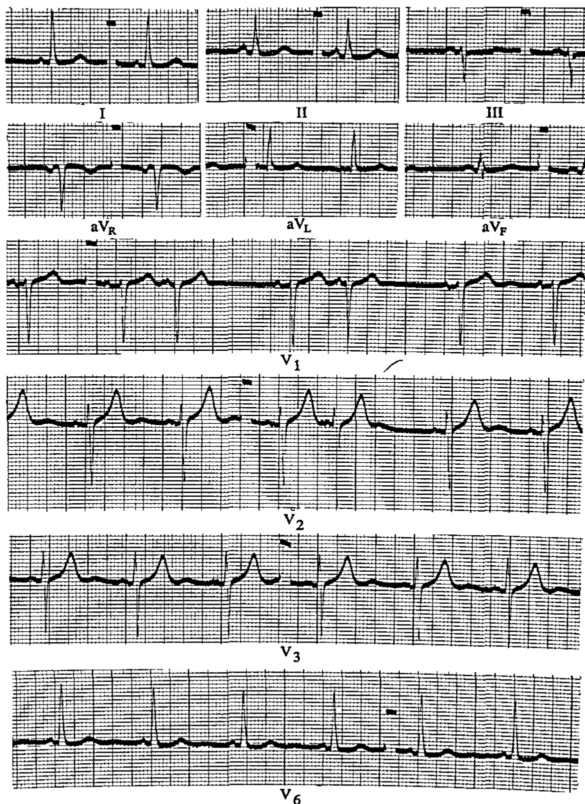
I The rhythm is

A atrial fibrillation
B atrial flutter
C a complete AV block with nodal rhythm
D atrial premature contractions

II The tracing suggests

A quinidine administration
B digitalis administration
C myocardial infarction
D right ventricular hypertrophy

71 YEAR OLD FEMALE DIABETES MELLITUS CHEST PAIN ON EFFORT NO CARDIAC DRUGS



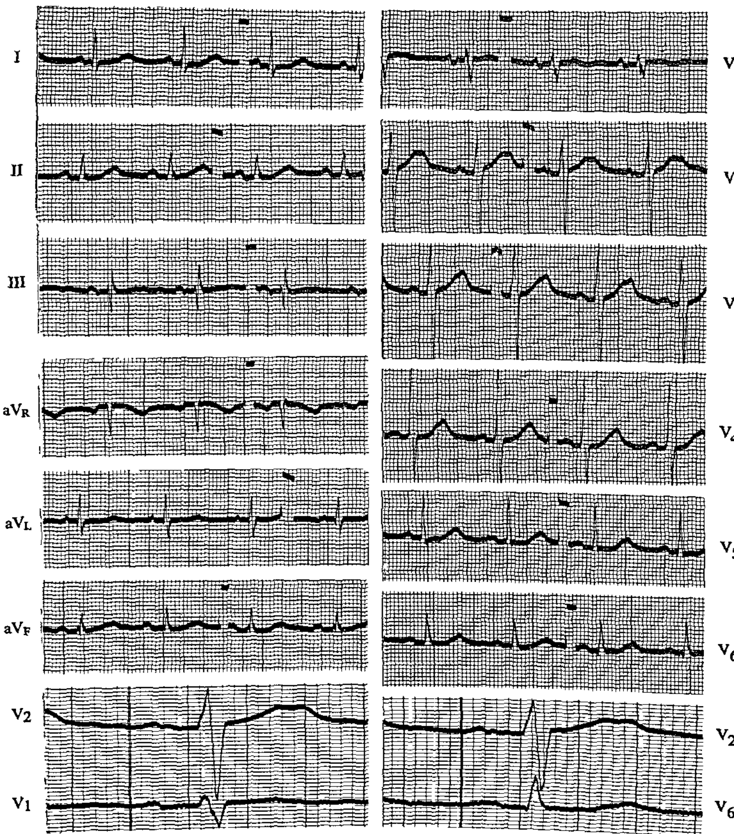
I The cardiac irregularity is

A atrial premature contractions
B nodal premature contractions
C septal ectopic beats
D ventricular extrasystoles

II The tracing is most consistent with

A left ventricular hypertrophy
B right ventricular hypertrophy

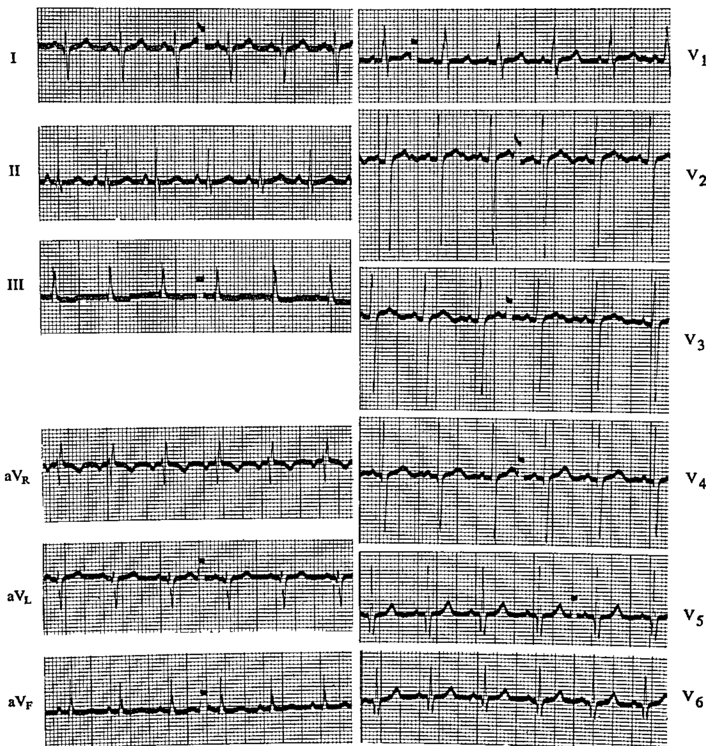
54 YEAR OLD WHITE MALE TAKING HEART PILLS BECAUSE OF PALPITATION FOR FIVE YEARS



The electrocardiogram is

- A normal
- B suggestive of quinidine procaine amide administration or hypocalcemia
- C typical of digitalis administration
- D typical of hyperpotassemia

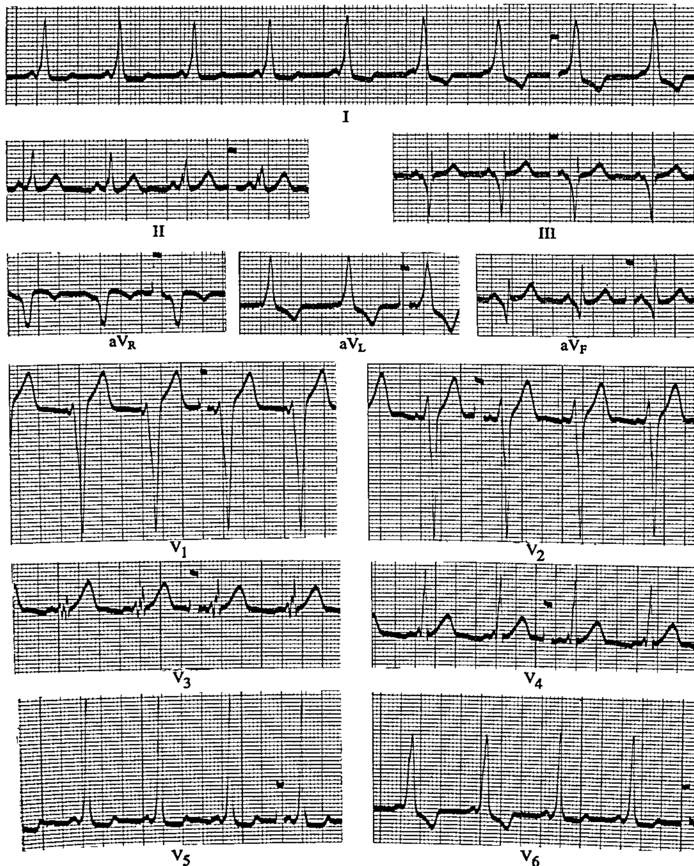
5 YEAR OLD BOY CYANOSIS SINCE BIRTH HEART OPERATION FOUR YEARS AGO



The electrocardiogram suggests

A right ventricular hypertrophy
B no cardiac hypertrophy
C a complete right bundle branch block
D an acute pulmonary embolism

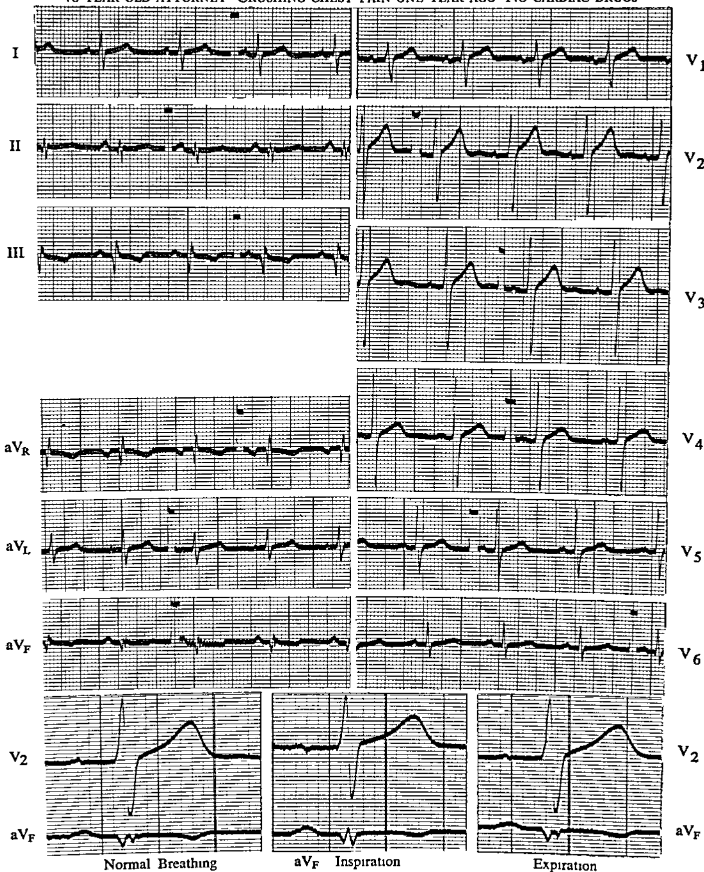
38 YEAR OLD FEMALE HEART MURMUR FOR YEARS NO CARDIAC DRUGS



The tracing indicates the presence of

A a complete left bundle branch block
B a complete and incomplete left bundle branch block
C an incomplete left bundle branch block
D an anomalous atrioventricular conduction (Wolff Parkinson White)

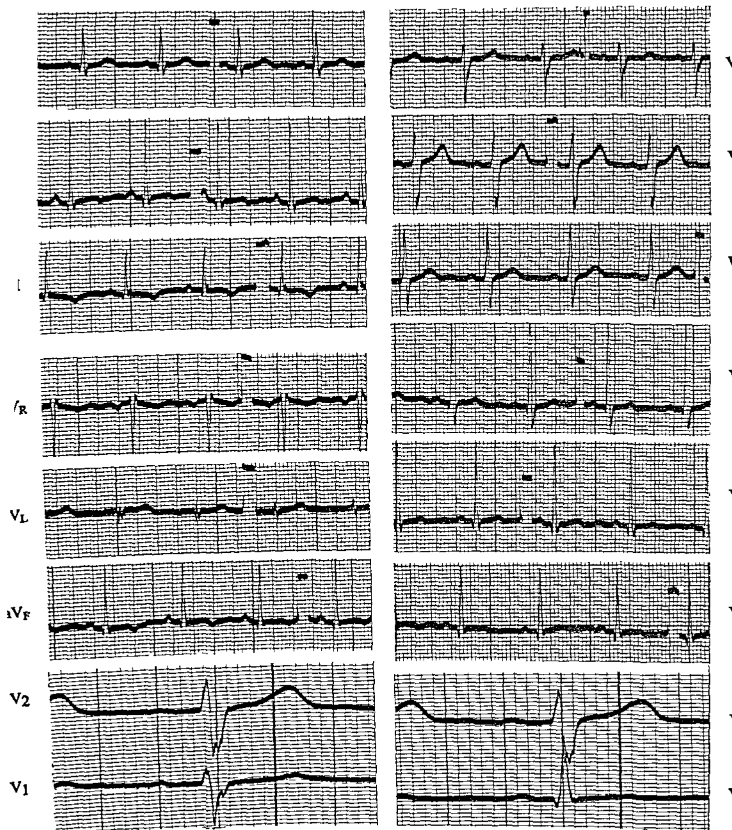
48 YEAR OLD ATTORNEY CRUSHING CHEST PAIN ONE YEAR AGO NO CARDIAC DRUGS



The electrocardiogram

- A has a normal vertical electrocardiographic position
- B rules out a posterior infarct
- C is in keeping with a posterior infarct
- D has a normal semivertical ele…

37 YEAR OLD MALE CHEST PAIN ON EFFORT, THREE MONTHS



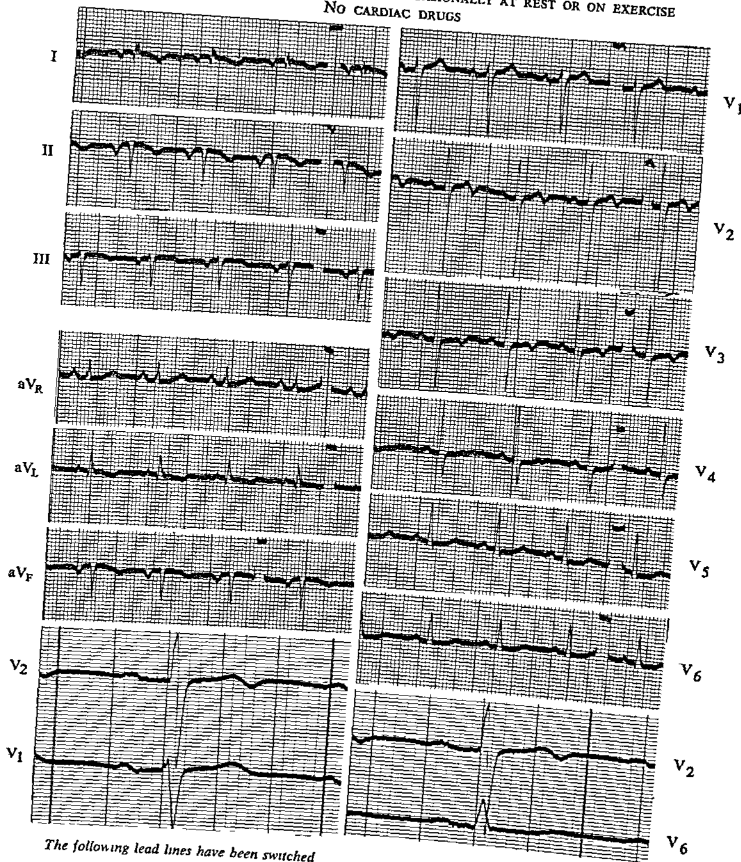
I The electrocardiographic position is

- A vertical
- B semivertical
- C intermediate
- D semihorizontal
- E horizontal
- F indeterminate

II The tracing suggests

- A anteroseptal myocardial ischemia
- B posterior myocardial ischemia
- C posterior myocardial infarct
- D septal infarct

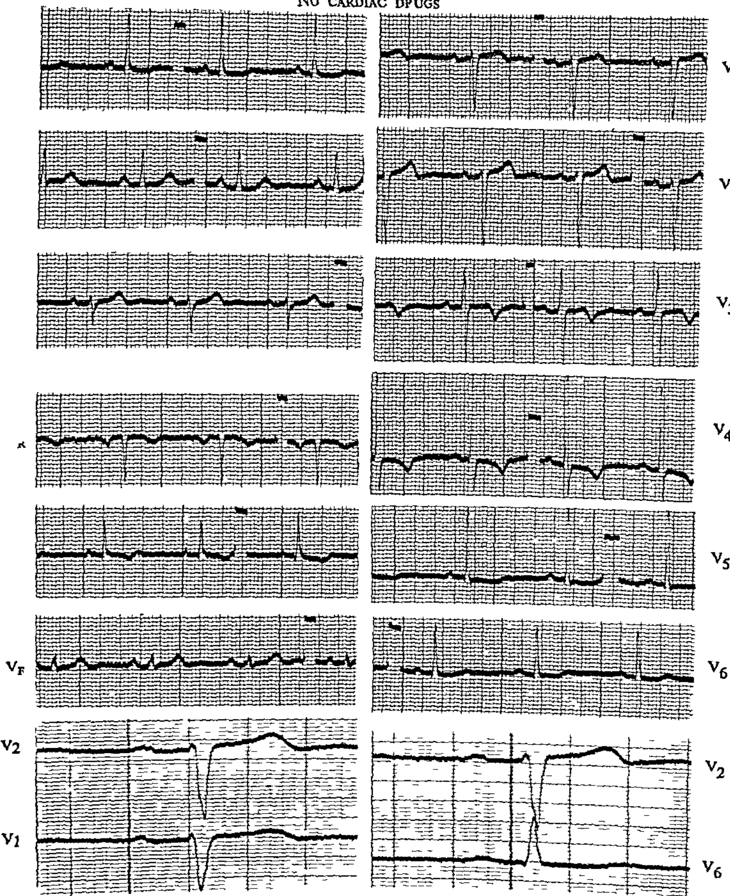
48 YEAR OLD WHITE MALE CHEST PAIN OCCASIONALLY AT REST OR ON EXERCISE
NO CARDIAC DRUGS



The following lead lines have been switched

A lead I (right arm and left arm) wires when attached to the arms
B lead II (right arm and left leg) wires when attached to the right arm and left leg
C lead III (left arm and left leg) wires when attached to the left arm and left leg

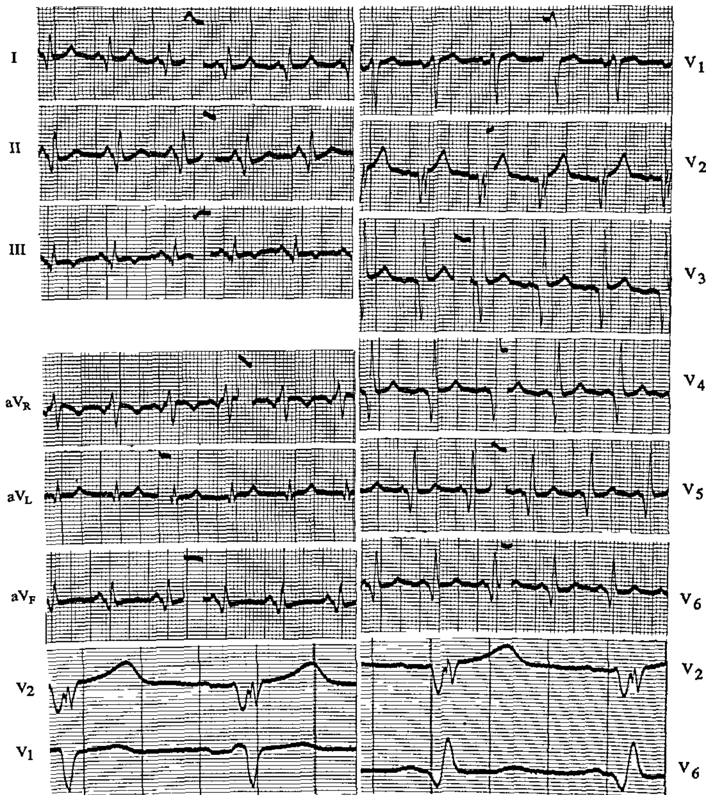
72 YEAR OLD WHITE MALE PHYSICIAN MINIMAL CHEST PAIN LASTING THREE MINUTES
NO CARDIAC DRUGS



The electrocardiogram is suggestive of

- A ischemia involving the anterior wall of the left ventricle
- B ischemia involving the posterior wall of the left ventricle
- C ischemia involving the posterior and anterior wall of the left ventricle

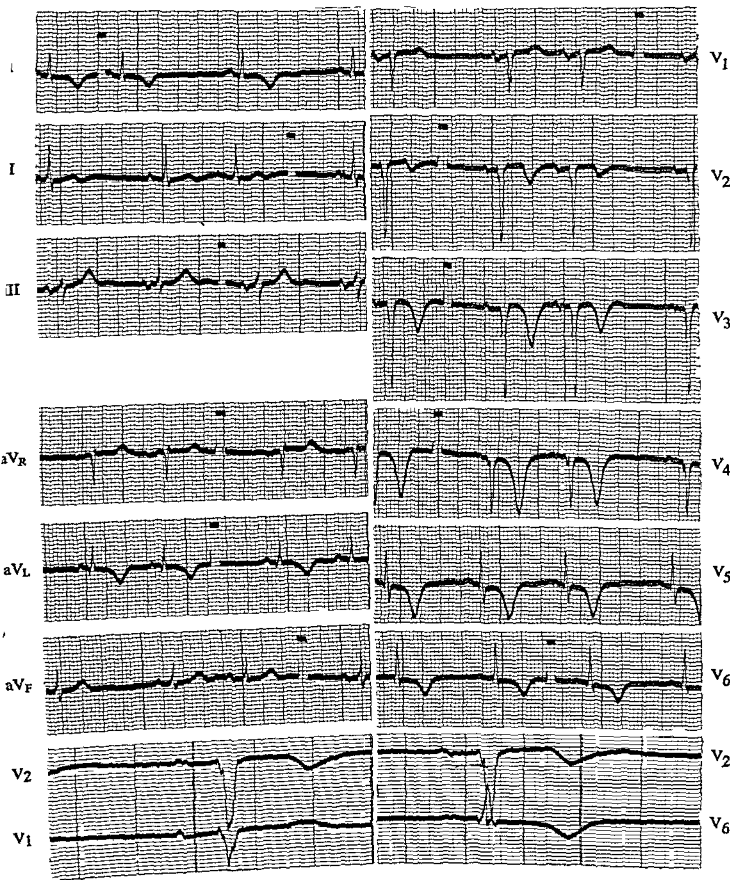
41 YEAR OLD MALE CHEST PAIN TWO YEARS AGO



The tracing indicates the presence of

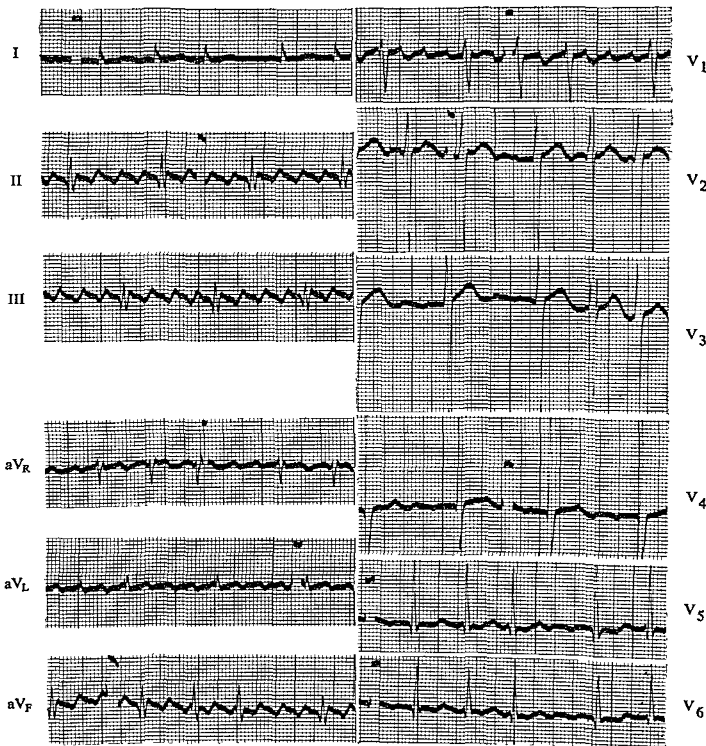
A an incomplete left bundle branch block
B an anterior and a posterior myocardial infarct
C an intraventricular block without a myocardial infarct
D an acute anterior and an acute posterior myocardial infarct

73 YEAR OLD MALE SEVERE CHEST PAIN SEVEN WEEKS AGO NO CARDIAC DRUGS



The tracing indicates the presence of

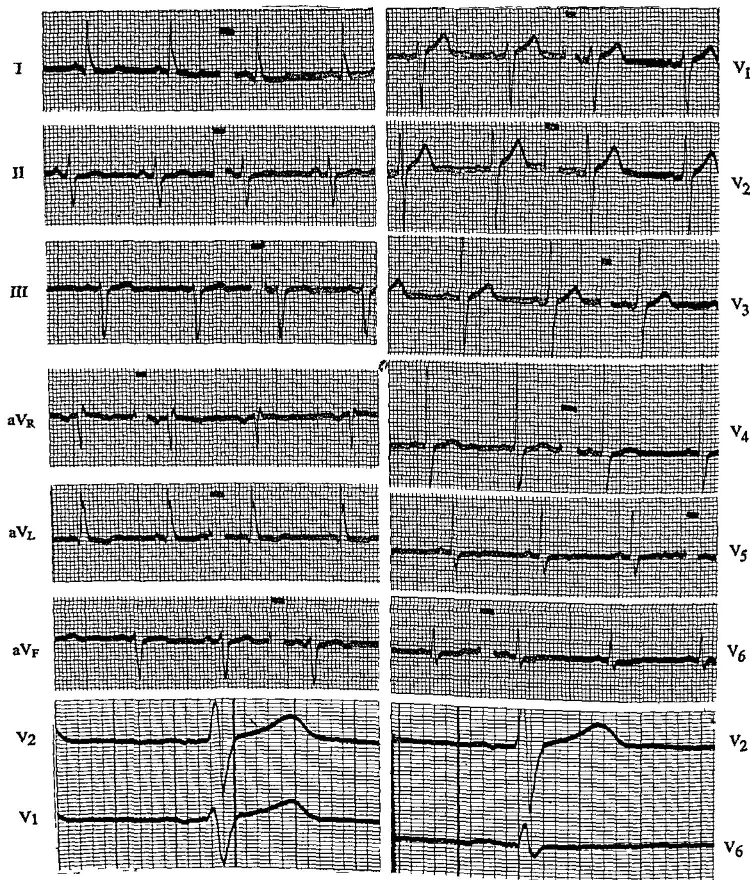
A anterior myocardial ischemia without myocardial infarction
B anterolateral myocardial infarction without other abnormalities
C anterolateral myocardial infarction with atrial premature contractions
D left ventricular hypertrophy



The rhythm is

A atrial fibrillation
B atrial flutter
C interference dissociation
D nodal tachycardia

58 YEAR OLD MALE NO CARDIAC DRUGS CHEST PAIN ON EFFORT



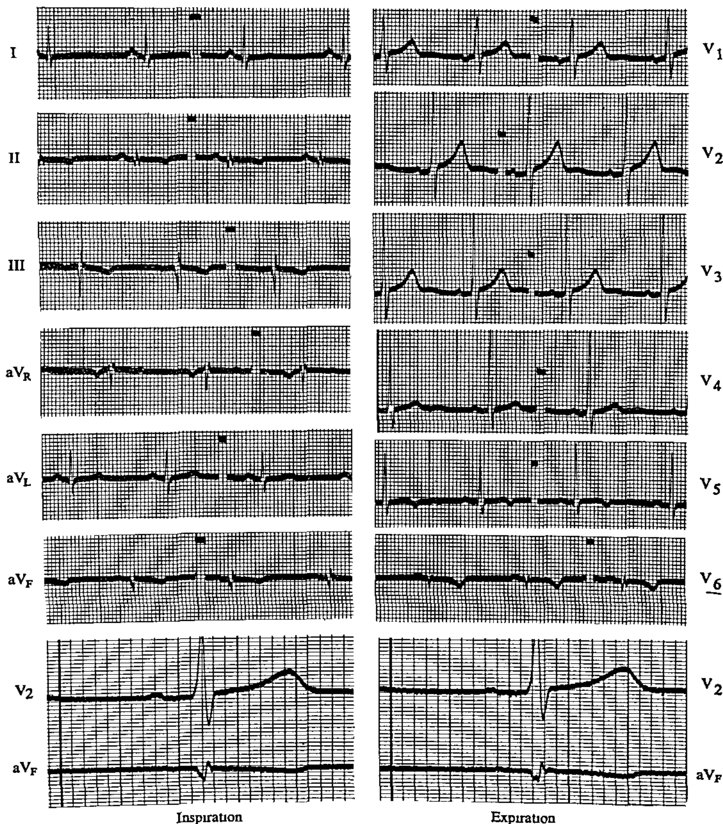
I The electric axis of the QRS complexes is

- A deviated to the right
- B deviated to the left
- C within normal limits

II Other abnormalities are

- A not present
- B present

56 YEAR OLD MALE MERCHANT SEVERE PRECORDIAL PAIN WITH SYNCOPE FOUR MONTHS AGO

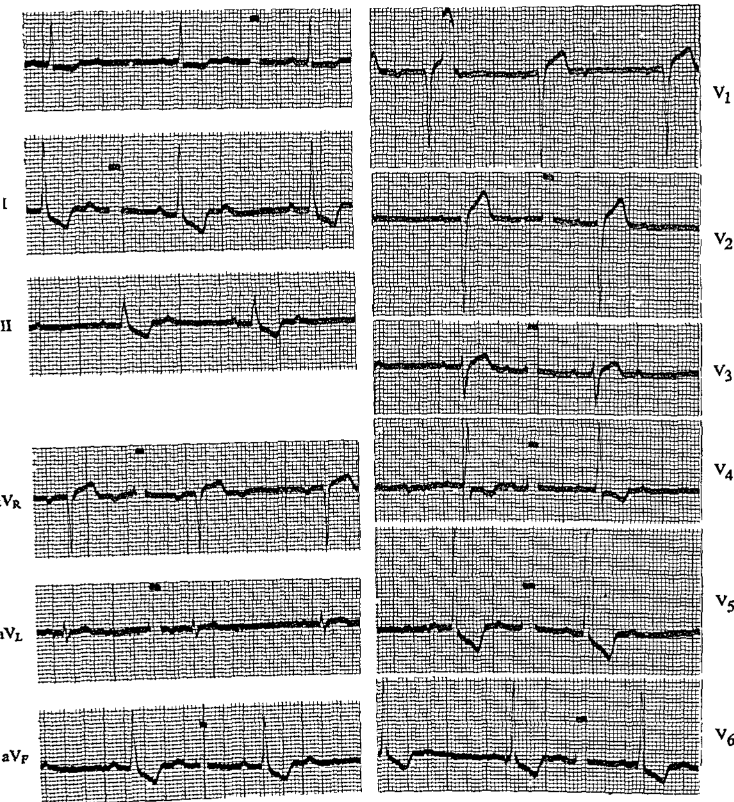


Inspiration Expiration

The tracing indicates the presence of

A an old (more than a month) posterior infarct with posterolateral myocardial ischemia
B a pulmonary infarct
C right ventricular hypertrophy
D a right incomplete bundle branch block

62 YEAR OLD MALE SUBSTERNAL PAIN ON EFFORT TEN YEARS DIGITALIS LEAF 0 1 GM DAILY



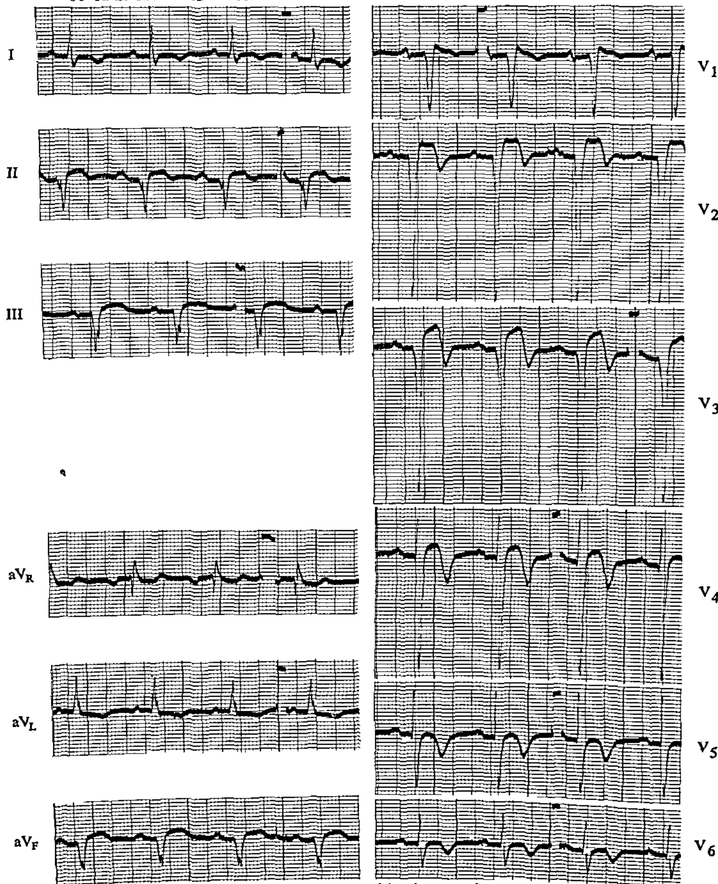
I The rhythm is

A a 2 1 sino-atrial block
B atrial premature contractions with an AV block
C a 2 1 AV block
D a complete AV block

II The following is present

A left ventricular hypertrophy in the presence of a semivertical heart
B left ventricular hypertrophy in the presence of an intermediate heart
C no evidence of left ventricular hypertrophy

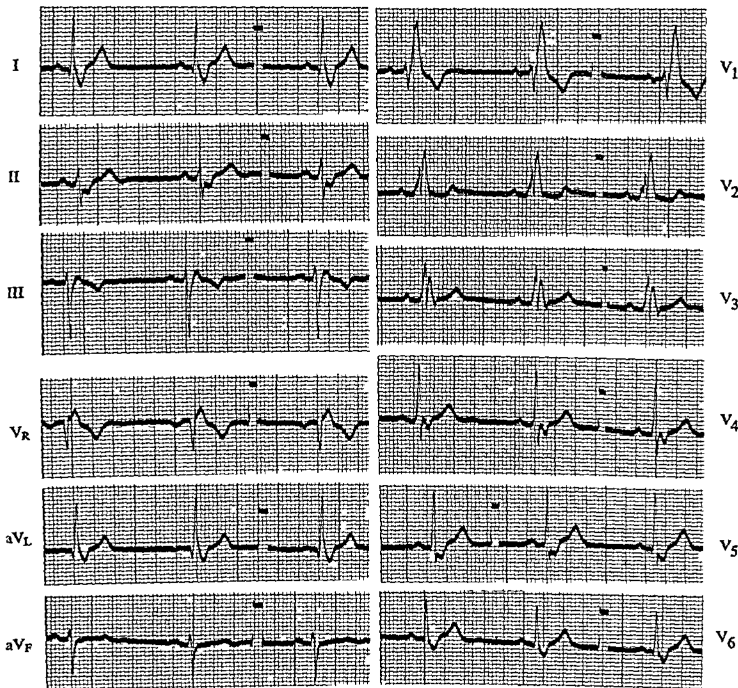
60 YEAR OLD MALE SUBSTERNAL PAIN TWO DAYS AGO WHICH LASTED SIX HOURS



If this tracing were to remain essentially unchanged for three months the following diagnosis would be likely

A chronic pericarditis
B aortic aneurysm
C ventricular aneurysm

55 YEAR OLD MALE CHEST PAIN ON EFFORT PENTAERYTHRITOL TETRANITRATE 40 0 MG DAILY



I The rhythm is

- A sinus bradycardia
- B normal sinus rhythm
- C sinus arrhythmia
- D nodal bradycardia

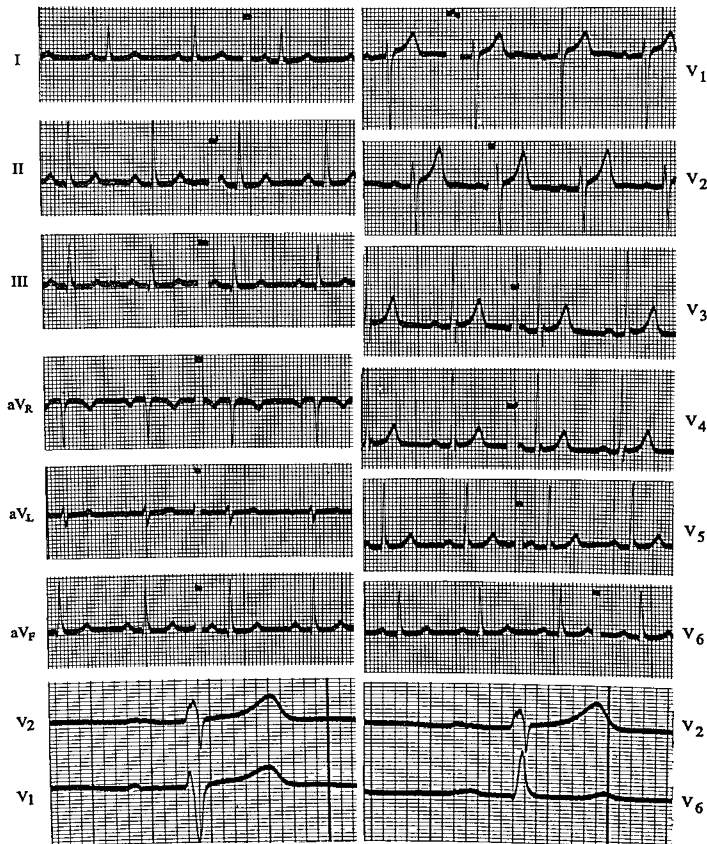
II The following is present

- A a right incomplete bundle branch block
- B a right complete bundle branch block
- C a left incomplete bundle branch block
- D a left complete bundle branch block

III The electrocardiographic position of the heart is

- A horizontal
- B intermediate
- C vertical

40 YEAR OLD MALE NO CARDIAC DRUGS CHEST PAIN



I The tracing is

A normal
B abnormal because of the positive segment shifts in lead V_2
C abnormal because of the Q waves in leads II III and aV_F

II The electrocardiographic position is

A semihorizontal
B horizontal
C semivertical

71 YEAR OLD MALE DYSPNEA FOR YEARS PALPITATION TEN DAYS NO CARDIAC DRUGS



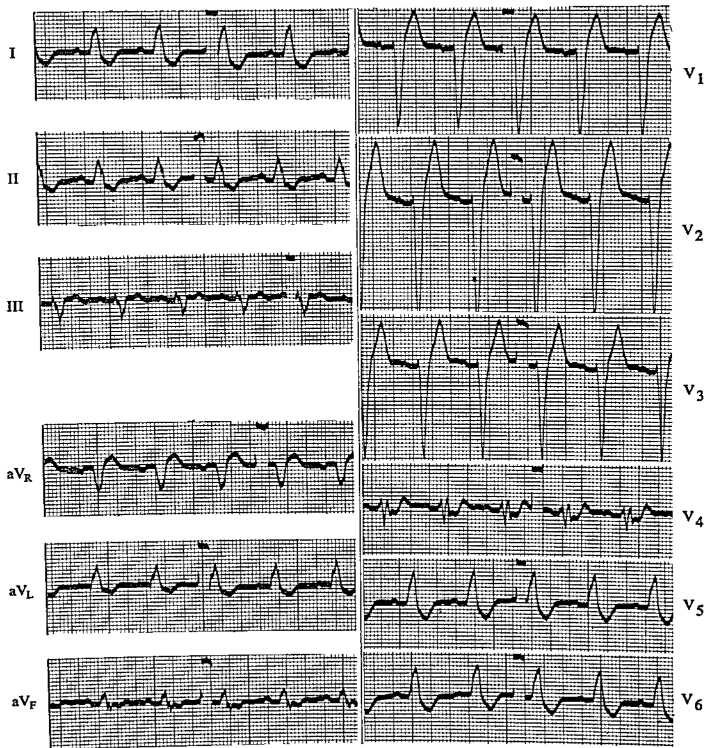
I The rhythm is

- A sinus tachycardia
- B incomplete AV block without dropped beats (first degree)
- ✓C incomplete AV block with dropped beats (second degree)

II The P waves are

- A entirely normal
- B in keeping with chronic pulmonary disease
- C typical of mitral stenosis

62 YEAR OLD MALE CHEST PAIN ON EXERTION SIX MONTHS AGO ACETYL DIGITOXIN 0 3 MGM DAILY

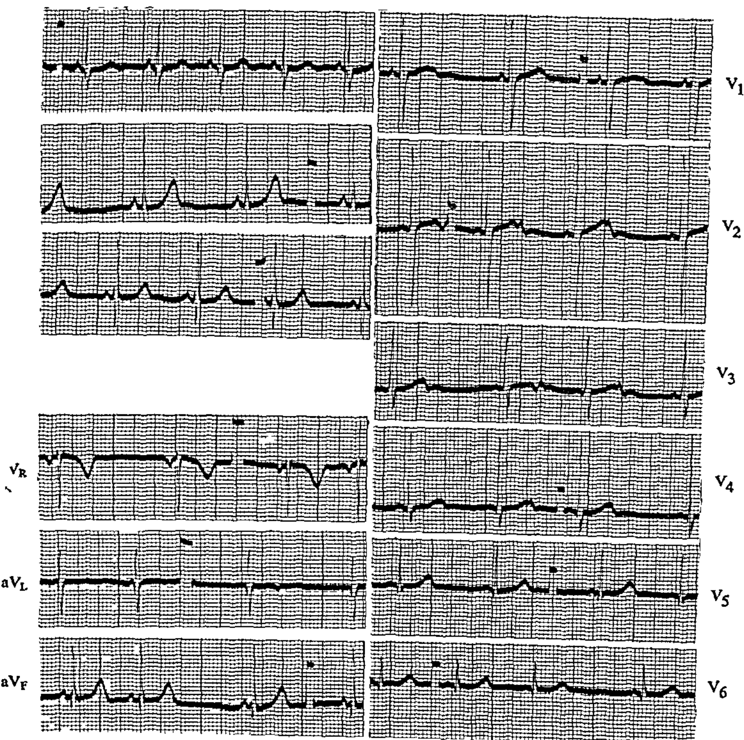


The tracing is typical of

A a left complete bundle branch block
B an incomplete left bundle branch block
C anomalous atrioventricular conduction (Wolff Parkinson White)
D ventricular tachycardia

8 YEAR OLD BOY SHORTNESS OF BREATH SINCE BIRTH NO DRUGS

(Half Standardization in Precordial Leads)



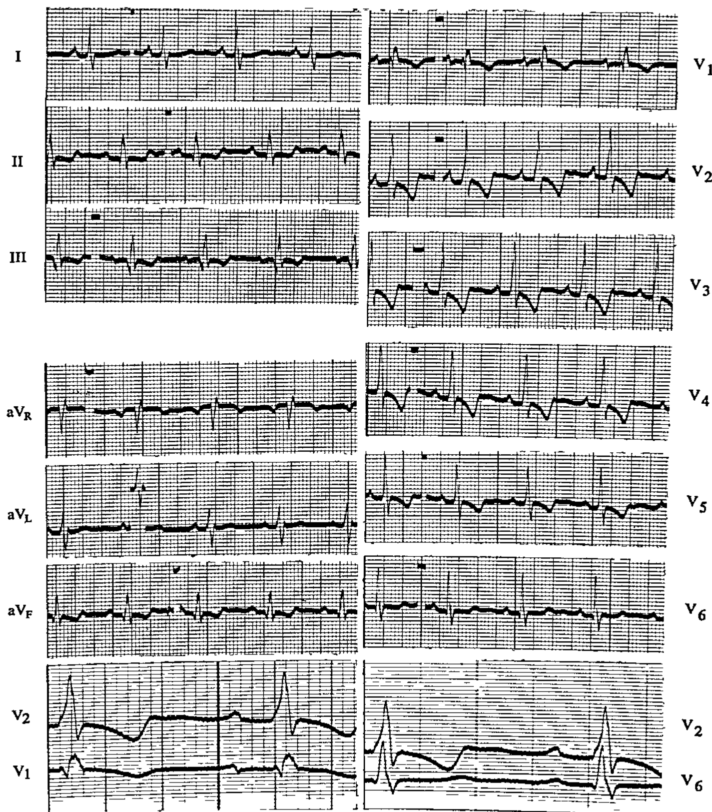
I The electrocardiogram suggests the presence of

- A left atrial enlargement
- B right ventricular hypertrophy
- C a right incomplete bundle branch block
- D right and left ventricular hypertrophy

II The rhythm is

- A sinus tachycardia
- B sinus bradycardia
- C sino atrial block
- D sinus arrhythmia

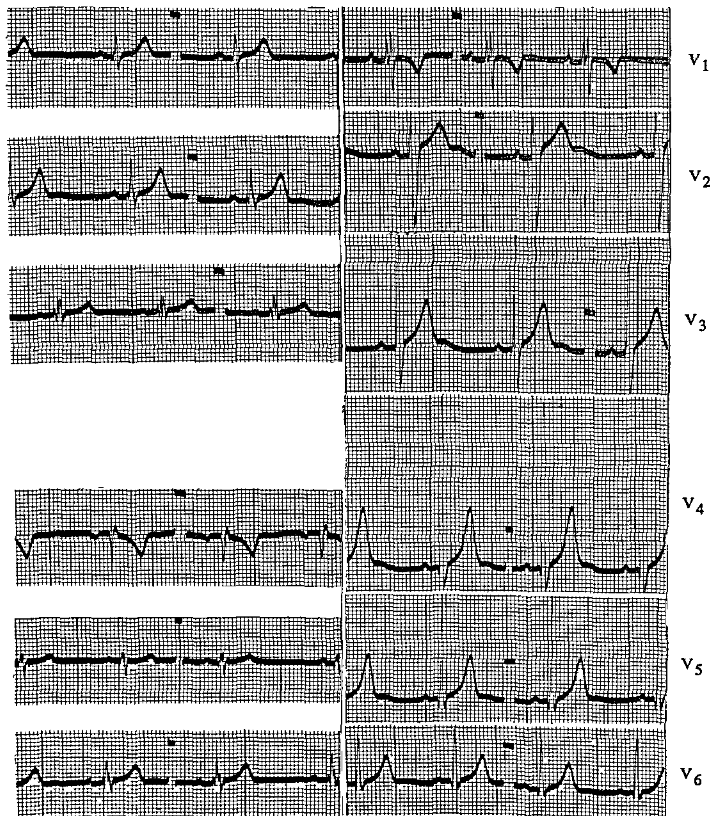
19 YEAR OLD FEMALE SHORTNESS OF BREATH TEN YEARS TAKING DIGITALIS



The electrocardiogram is consistent with

A diastolic overload of the right ventricle
B left ventricular hypertrophy
C an incomplete left bundle branch block
D anomalous atrioventricular conduction (Wolff Parkinson White)

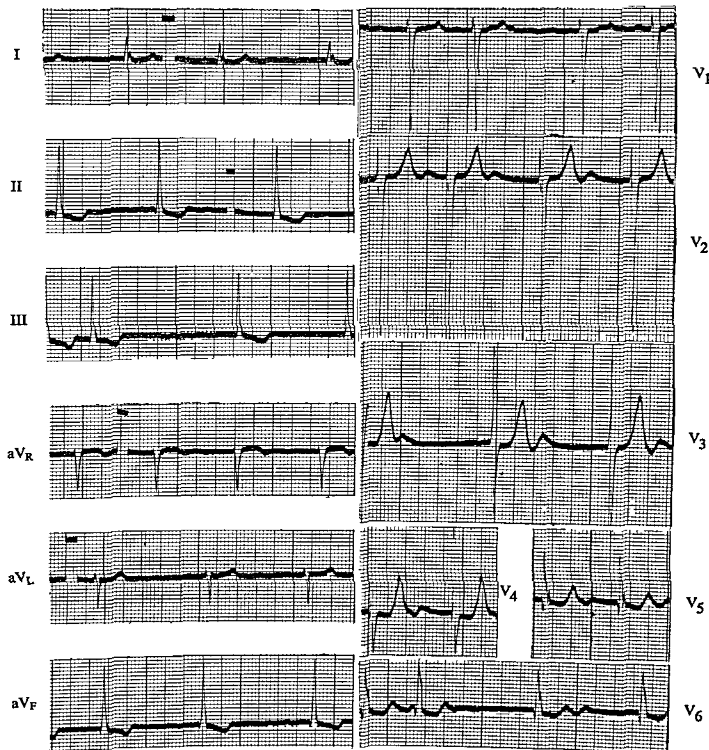
36 YEAR OLD MALE ATHLETE No COMPLAINTS



The rhythm is

- A sinus bradycardia
- B sinus tachycardia
- C normal sinus rhythm
- D sino-atrial block

46 YEAR OLD FEMALE SHORTNESS OF BREATH ON EXERTION FIFTEEN YEARS
DIGITALIS LEAF 0 1 GM DAILY



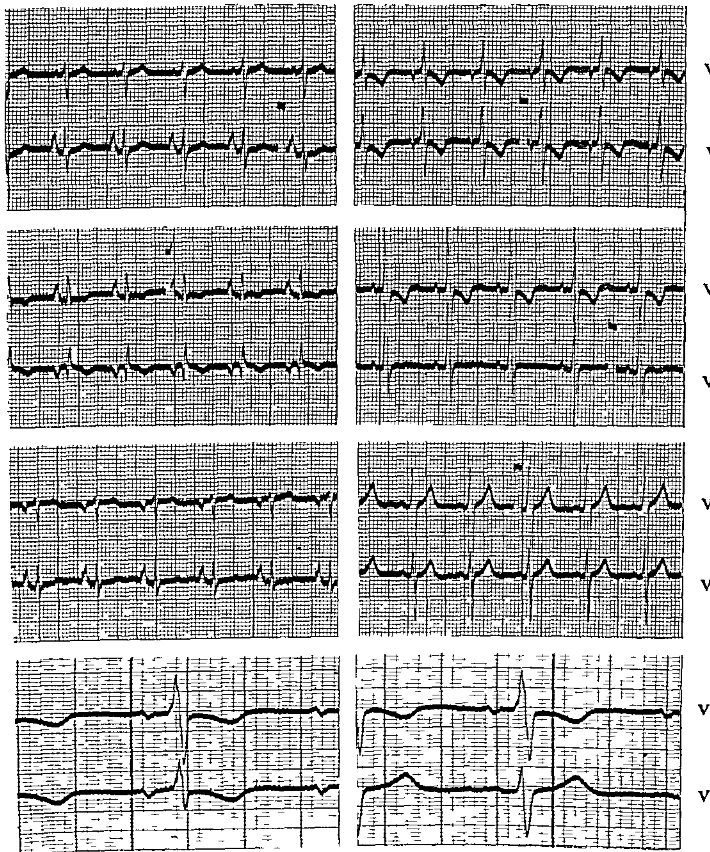
I The following is present

A atrial fibrillation and left ventricular hypertrophy
B atrial fibrillation and right ventricular hypertrophy
C atrial flutter and left ventricular hypertrophy
D atrial flutter and right ventricular hypertrophy

II The U waves are

A normal size
B abnormally large
C abnormally small
D absent

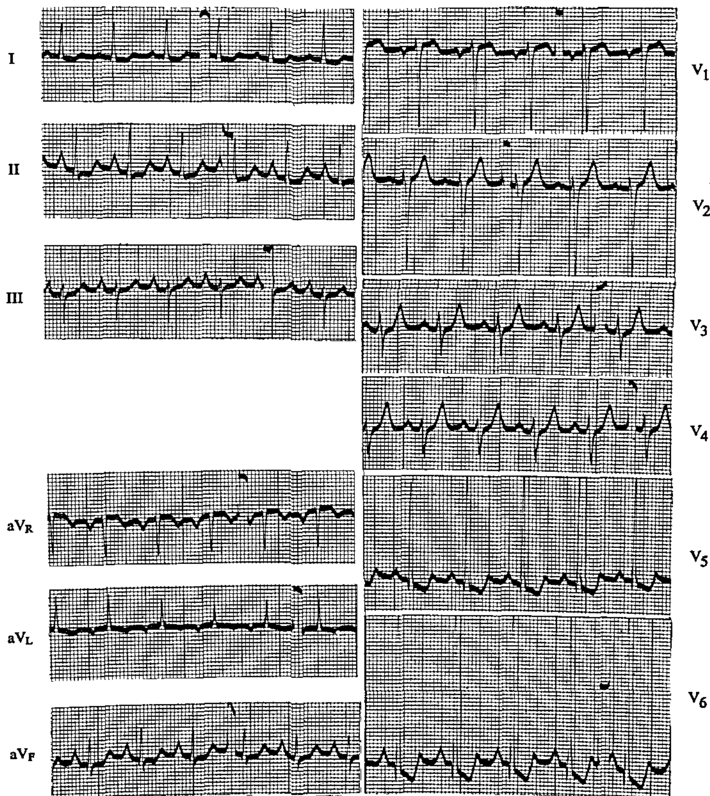
62 YEAR OLD RETIRED MALE SEVERE DYSPNEA ON SLIGHT EXERTION FIFTEEN YEARS
NO ORTHOPNEA



The tracing suggests

A atrial enlargement only
B ventricular hypertrophy only
C atrial enlargement and right ventricular hypertrophy
D ventricular aneurysm

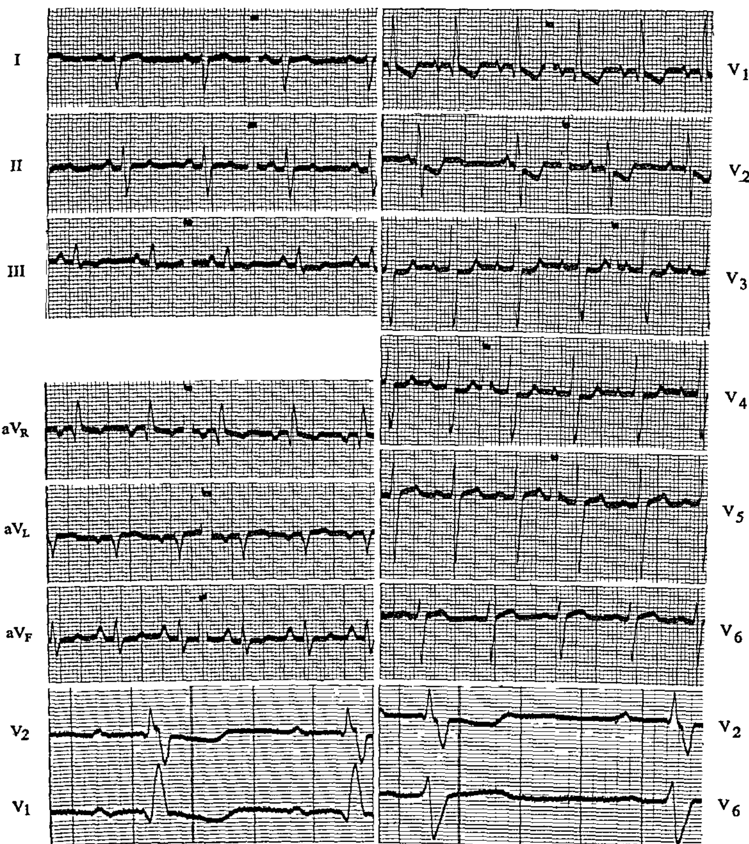
60 YEAR OLD FEMALE SHORTNESS OF BREATH EIGHT YEARS



The electrocardiogram suggests the following

A right ventricular hypertrophy only
B atrial enlargement left ventricular hypertrophy and quinidine effect
C atrial enlargement left ventricular hypertrophy and digitalis effect
D digitalis effect and left ventricular hypertrophy without atrial enlargement

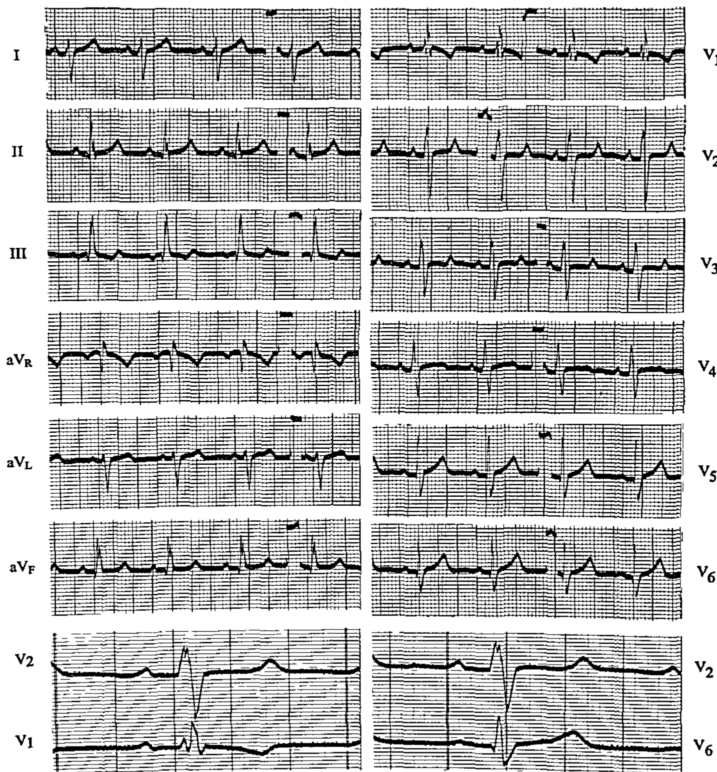
30 YEAR OLD FEMALE SHORTNESS OF BREATH TWELVE YEARS TAKING DIGITALIS



The electrocardiogram suggests

- A right ventricular hypertrophy
- B a right bundle branch block
- C pericarditis
- D pulmonary infarction

30 YEAR OLD FEMALE HEART MURMUR SINCE BIRTH



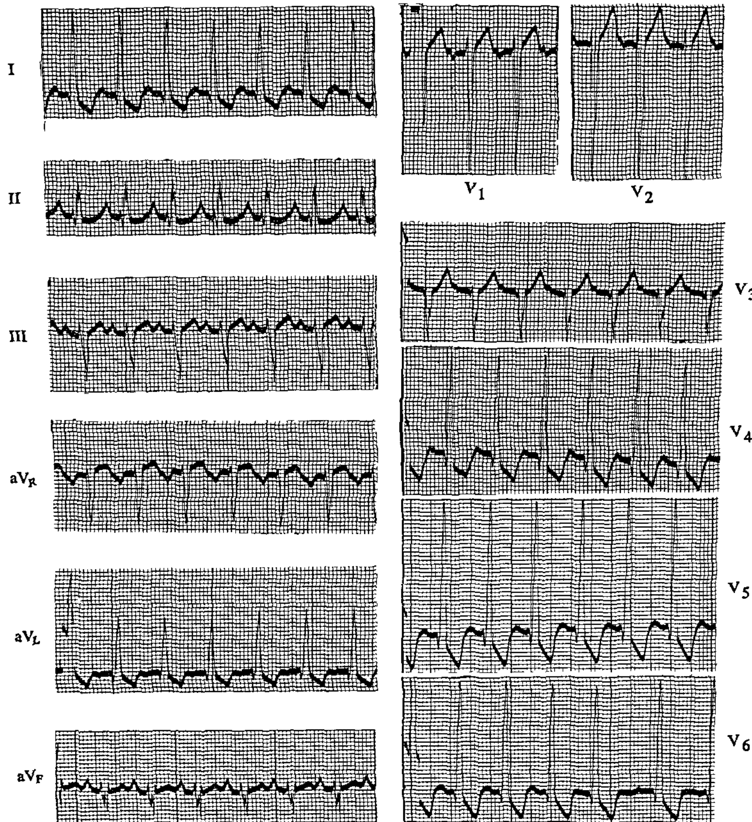
I The mean electric axis of the QRS complexes

- A is deviated to the right
- B is deviated to the left
- C shows no unusual deviation

II The following is present

- A a posterolateral myocardial infarct
- B an incomplete right bundle branch block
- C a complete right bundle branch block

54 YEAR OLD MALE PALPITATION DIGITALIS LEAF 0 1 GM DAILY



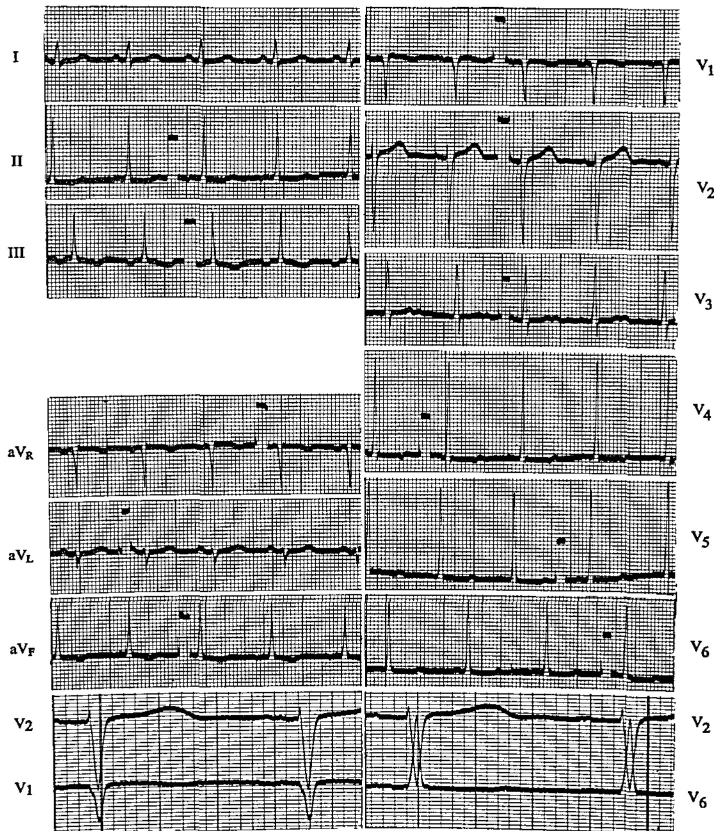
I The following is present

A normal sinus rhythm
B sinus arrhythmia
C nodal rhythm
D supraventricular tachycardia

II The following is present

A left ventricular hypertrophy
B an old posterior infarct
C right ventricular hypertrophy
D a left complete bundle branch block

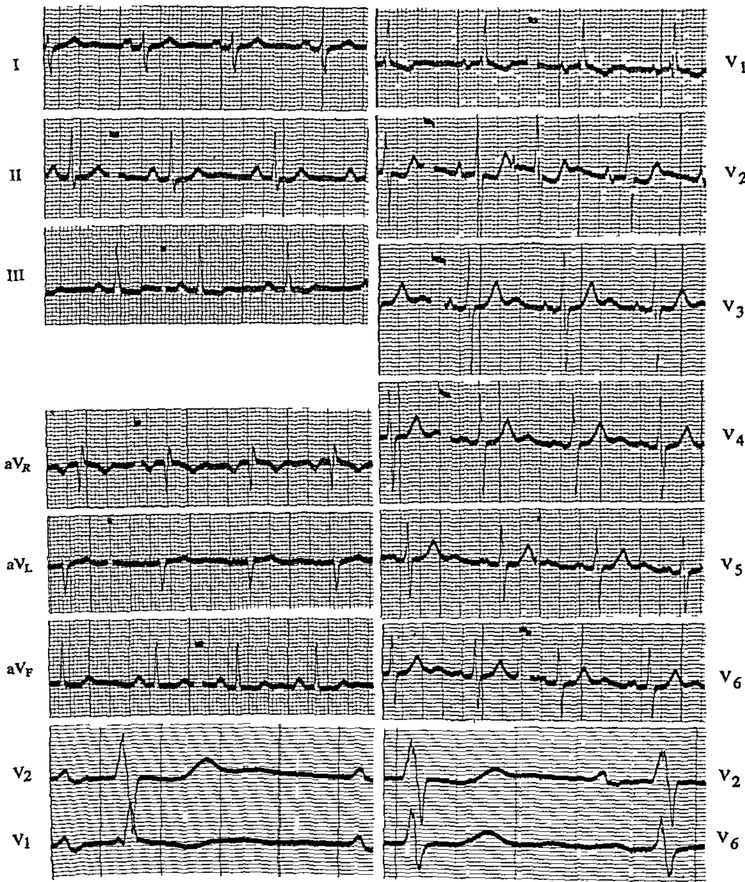
30 YEAR OLD COLORED FEMALE ULCERS OF ANKLES ONE YEAR NO CARDIAC DRUGS



The electrocardiogram

A is normal
B indicates coronary artery disease
C is consistent with an abnormal myocardium
D is diagnostic of hypertensive heart disease

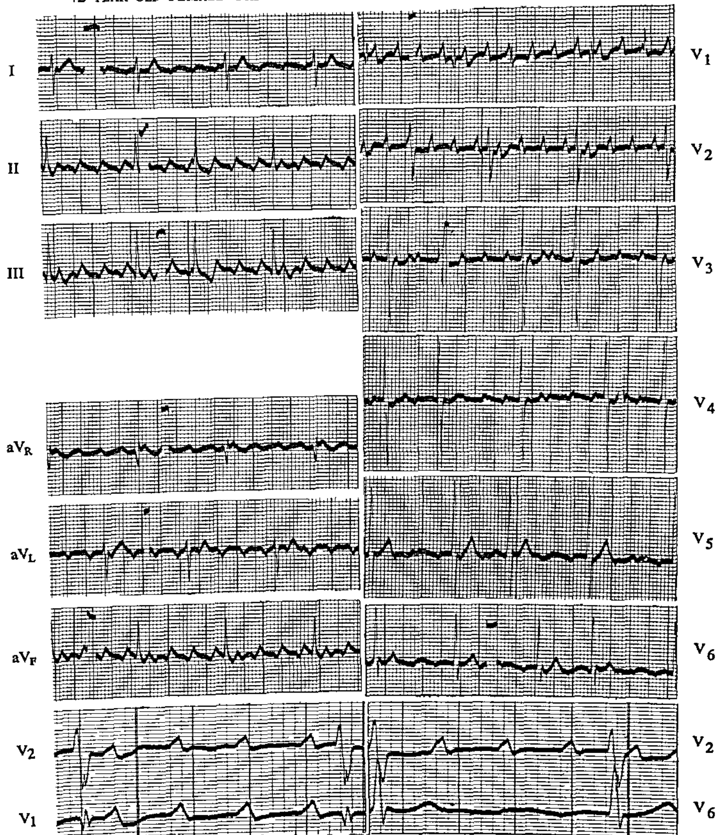
29 YEAR OLD FEMALE



The tracing is suggestive but not diagnostic of

A tricuspid stenosis
B mitral stenosis
C coarctation of the aorta
D patent ductus arteriosus
E right aortic arch

42 YEAR OLD FEMALE PALPITATION FOUR DAYS DIGITALIS LEAF 0.1 GM DAILY



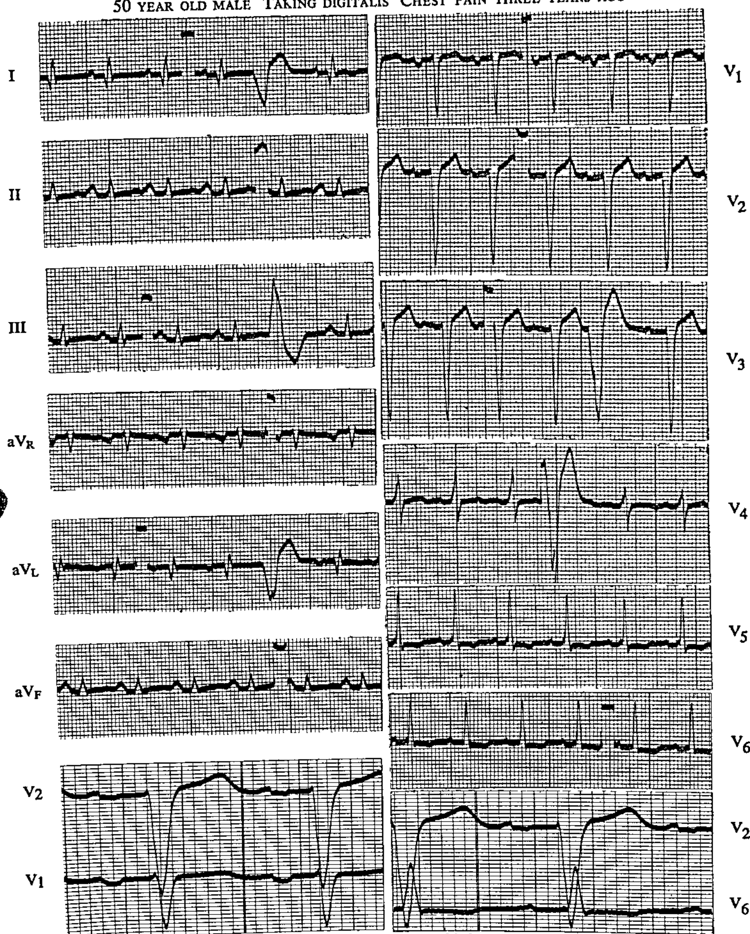
I The rhythm is

A atrial flutter with block or atrial tachycardia with block
B parasystole
C incomplete interference dissociation

II There is

A suggestive evidence of right ventricular hypertrophy
B suggestive evidence of left ventricular hypertrophy

50 YEAR OLD MALE TAKING DIGITALIS CHEST PAIN THREE YEARS AGO



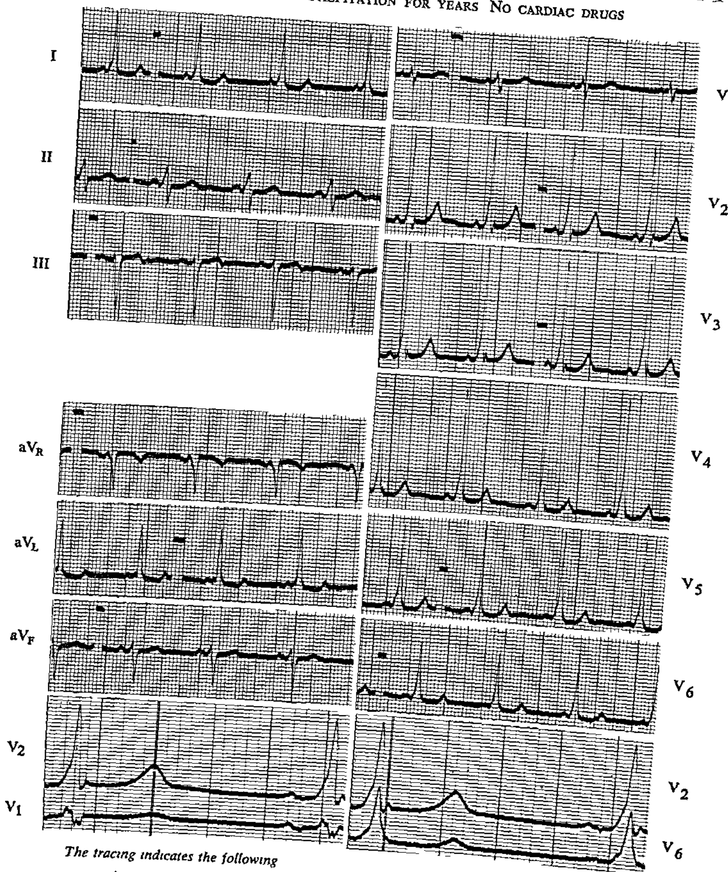
I *The time of onset of the intrinsicoid deflection in lead* V$_6$ *is*

A delayed
B normal
C short

II *The following is likely*

A a myocardial infarct with ventricular ectopic beats
B ventricular ectopic beats and anomalous atrioventricular conduction (Wolff Parkinson White)

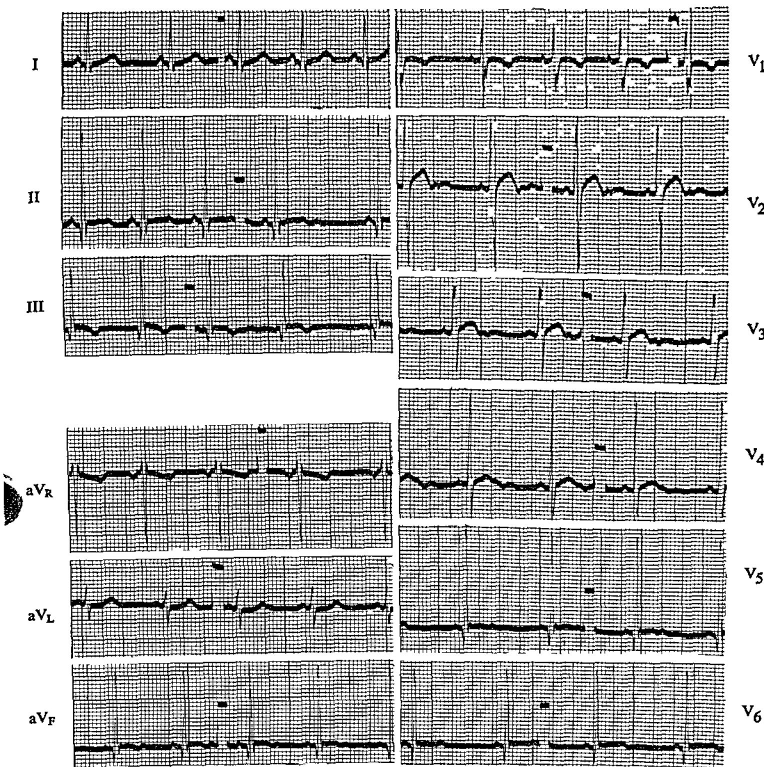
50 YEAR OLD MALE PALPITATION FOR YEARS NO CARDIAC DRUGS



The tracing indicates the following

- A a true left bundle branch block
- B anomalous atrioventricular excitation (Wolff Parkinson White)
- C left ventricular hypertrophy
- D right ventricular hypertrophy

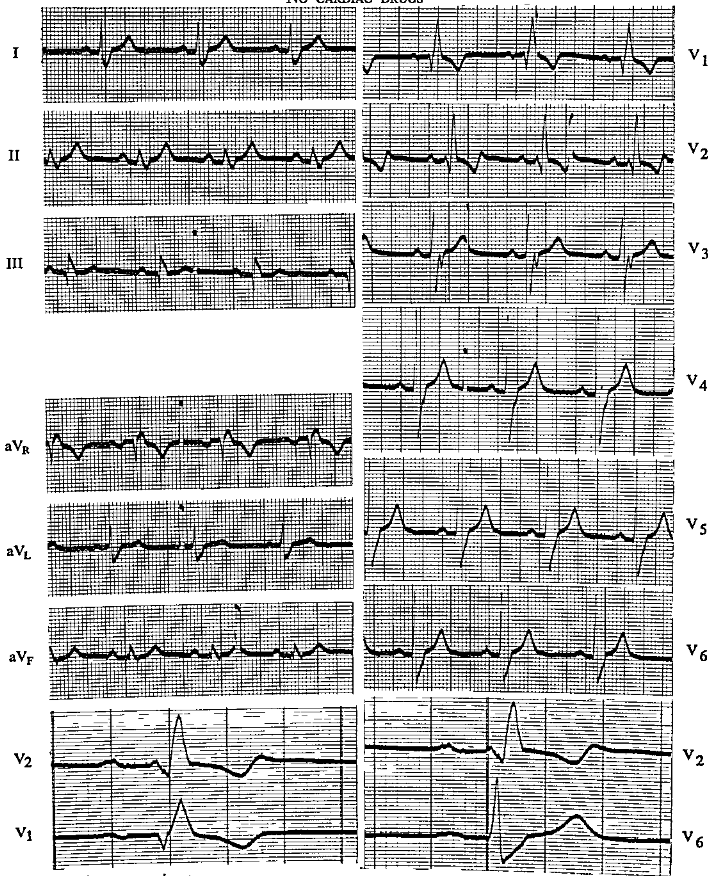
13 YEAR OLD BOY JOINT PAINS TWO YEARS AGO NO CARDIAC DRUGS



The electrocardiogram is

A normal
B in keeping with a diagnosis of left and right ventricular hypertrophy
C excludes rheumatic heart disease
D is diagnostic of pericarditis

56 YEAR OLD WHITE MALE MINIMAL CHEST PAIN ON EXERTION SIX TIMES IN THE PAST YEAR
NO CARDIAC DRUGS



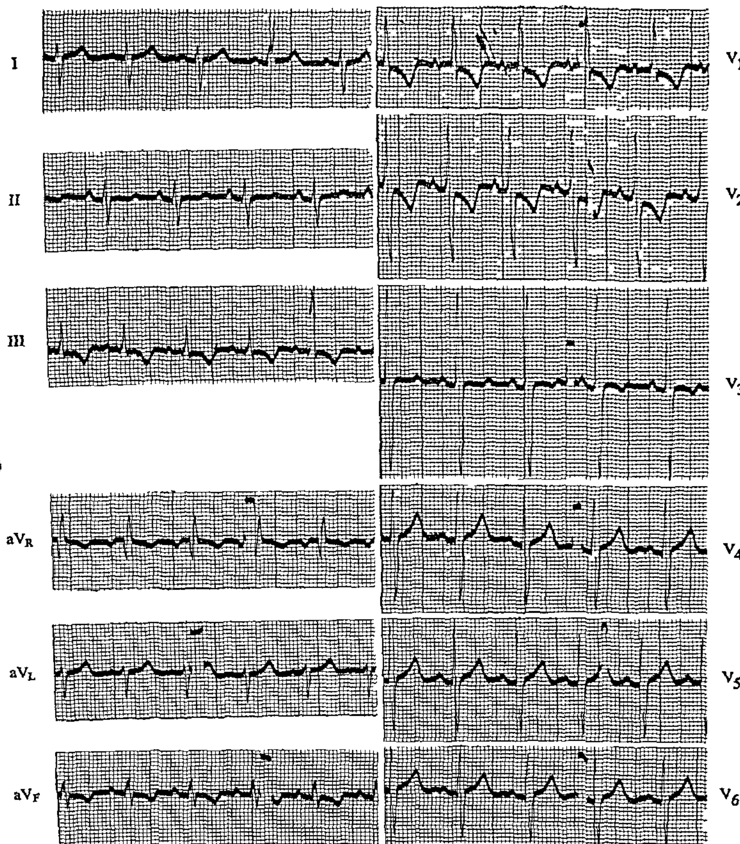
The tracing shows

A a right complete bundle branch block

B a right incomplete bundle branch block

C a right complete bundle branch block with an anterior myocardial infarct

36 YEAR OLD MALE SHORTNESS OF BREATH TEN YEARS NO CARDIAC DRUGS

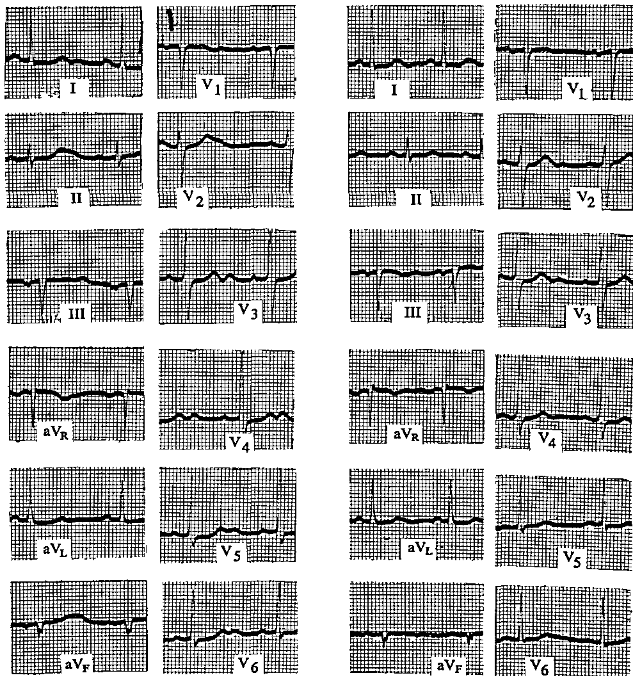


The tracing indicates the presence of

A left ventricular hypertrophy without right ventricular hypertrophy
B a complete right bundle branch block
C hypertrophy of the right ventricle
D an incomplete left bundle branch block

28 YEAR OLD MALE THREE DAYS POST-OPERATIVE NO DRUGS

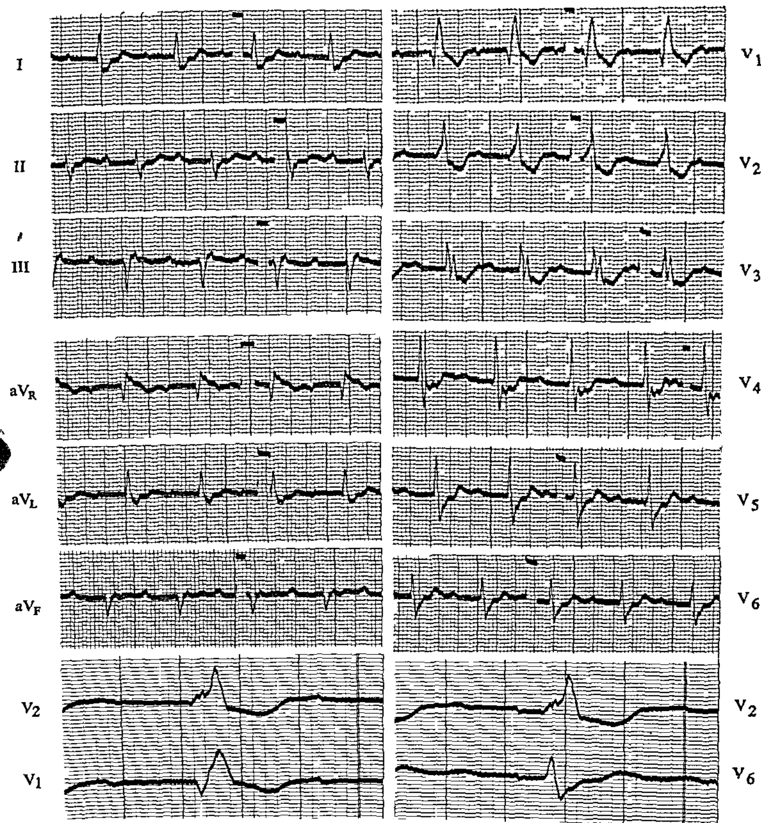
Before Treatment After Treatment



The tracing taken before treatment indicates

- A hyperkalemia
- B hypokalemia
- C hypercalmemia
- D hypernatremia

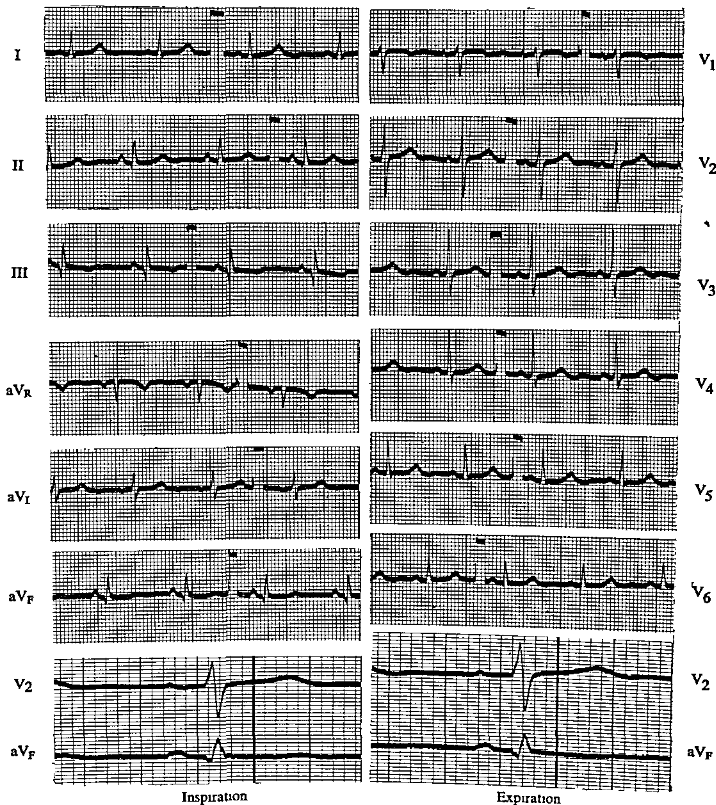
68 YEAR OLD MALE CHEST PAIN LASTING TWO HOURS THREE DAYS AGO ON DIGITALIS



The conduction defects which are present (select more than one if necessary) are

A an incomplete AV block without dropped beats (first degree)
B a left complete bundle branch block
C a right complete bundle branch block
D an incomplete AV block with dropped beats (second degree)
E a complete AV block

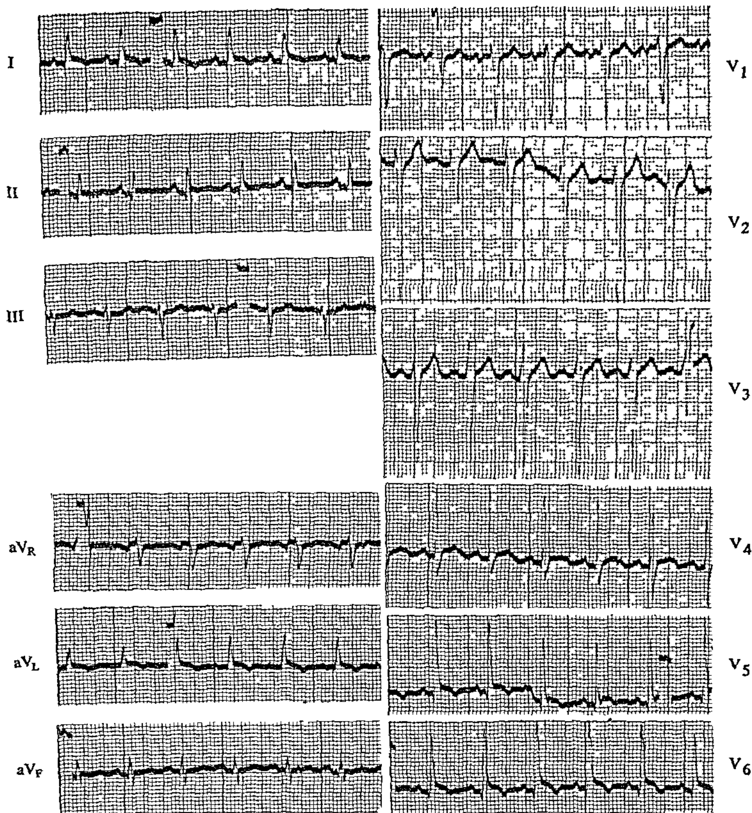
58 YEAR OLD FEMALE CHEST PAIN EIGHTEEN HOURS DURATION ONE YEAR AGO



The tracing is

- A diagnostic of a posterior infarct
- B consistent with but not diagnostic of a posterior myocardial infarct
- C entirely normal
- D suggestive of an acute pulmonary infarct

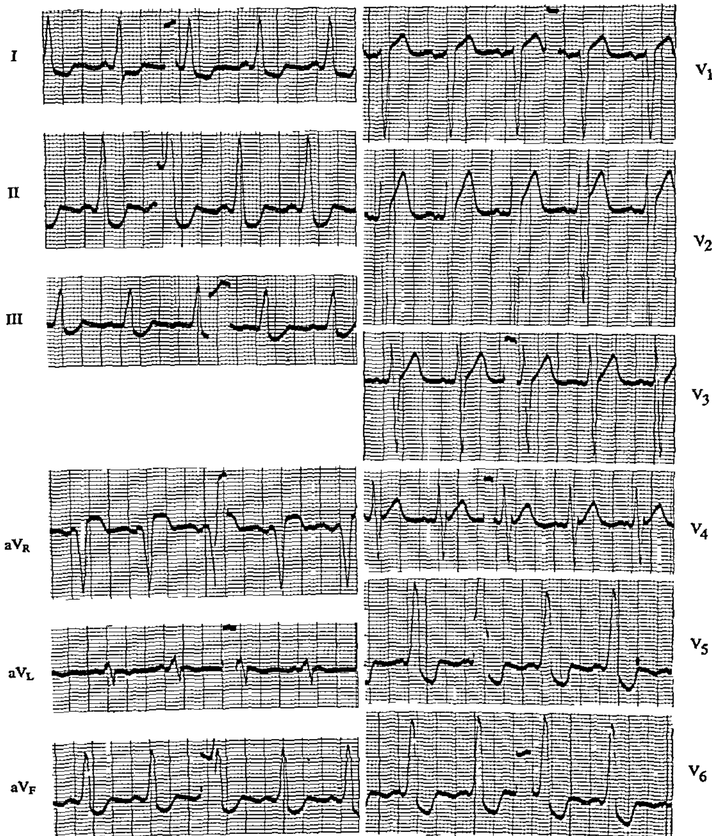
49 YEAR OLD FEMALE SHORTNESS OF BREATH SIX MONTHS



The tracing is indicative of

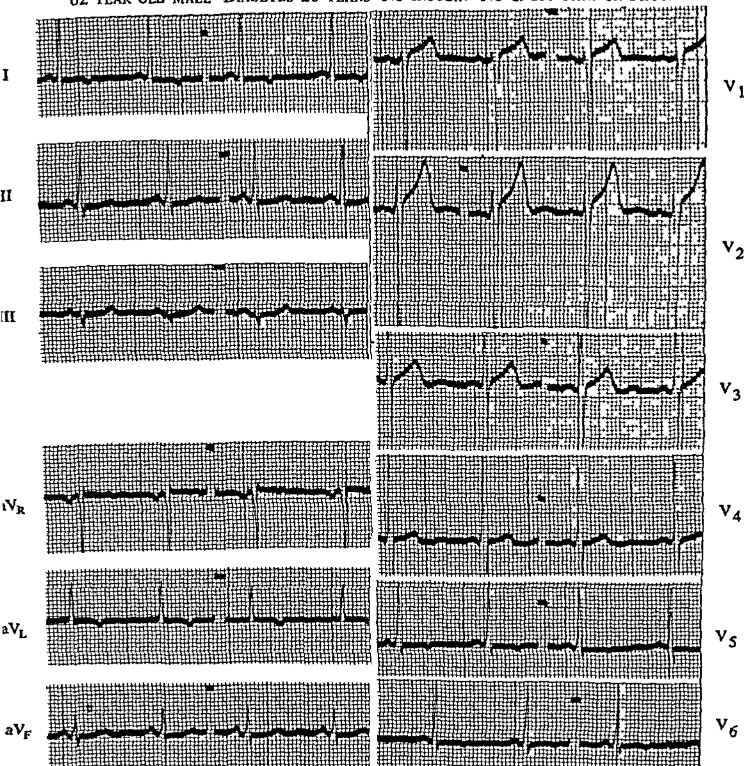
- A an acute lateral myocardial infarct
- B an acute injury to the subepicardial surface of the left ventricle
- C coronary insufficiency
- D coronary arteriosclerosis

61 YEAR OLD MALE CHEST PAIN FIVE YEARS AGO DIGITALIS LEAF 0 1 GM DAILY



The following is present

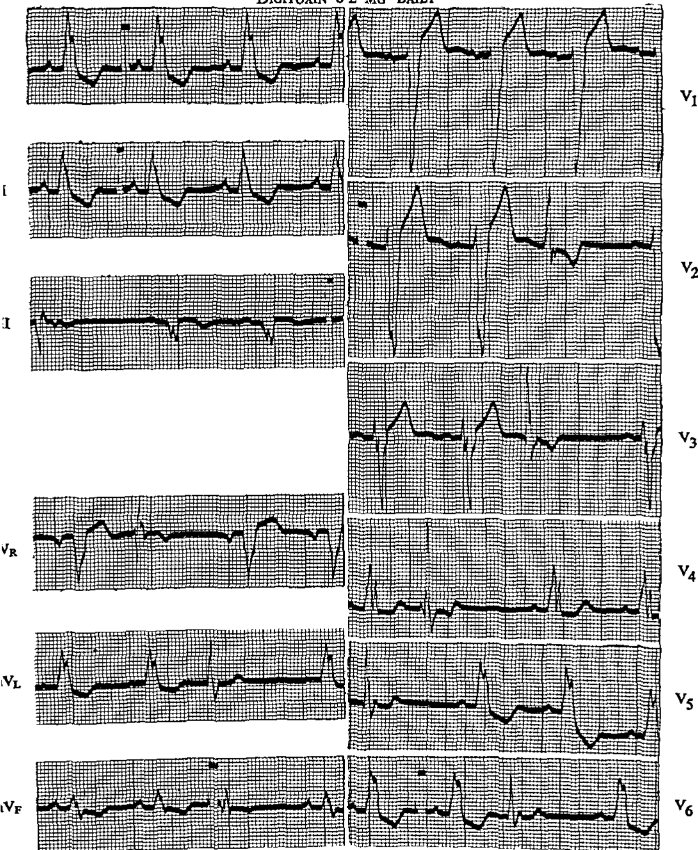
A a false bundle branch block (Wolff Parkinson White)
B an incomplete left bundle branch block with digitalis effect
C a posterior peri infarction block
D a complete right bundle branch block



The electrocardiogram

- A is within normal limits
- B is diagnostic of an electrolyte disturbance
- C represents a transmural anterior myocardial infarct
- D is suggestive of left ventricular hypertrophy and/or myocardial ischemia

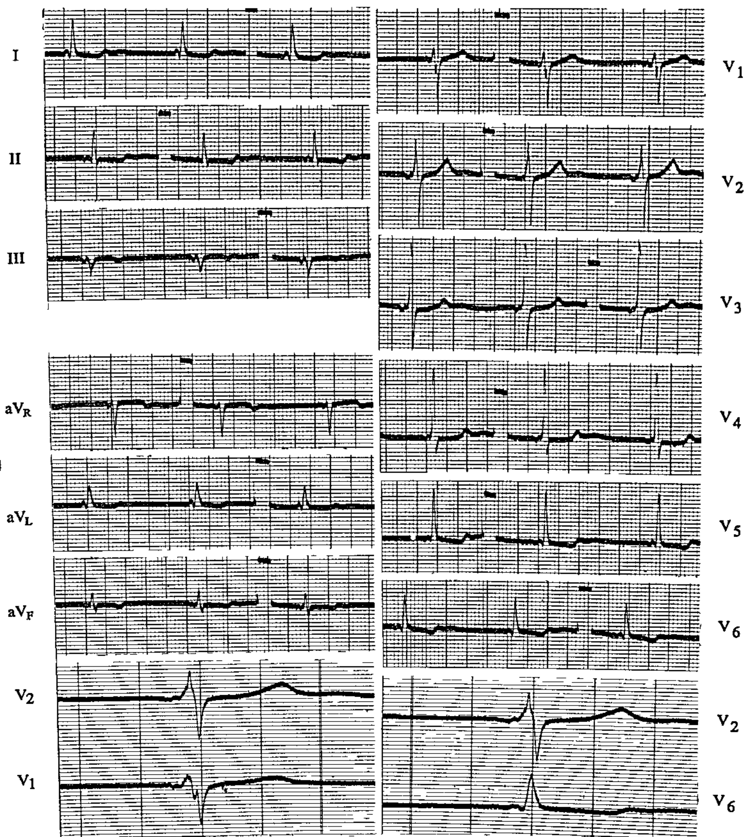
68 YEAR OLD WHITE DENTIST SEVERE DYSPNEA WHEN SUPINE AND ON EXERCISE
DIGITOXIN 0 2 MG DAILY



The electrocardiogram shows

A a complete left bundle branch block
B a complete left bundle branch block with ventricular ectopic beats
C an incomplete left bundle branch block
D an incomplete left bundle branch block with ventricular ectopic beats

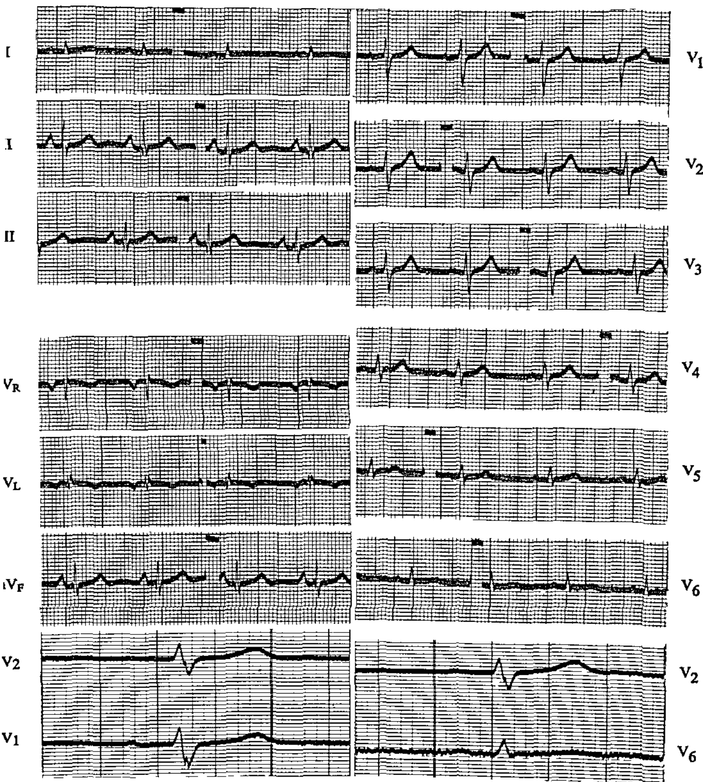
61 YEAR OLD MALE CHEST PAIN INTERMITTENTLY FOR FIVE YEARS DIGITALIS 0 1 GM DAILY



The rhythm is

A normal sinus rhythm
B sinus bradycardia
C nodal rhythm with retrograde conduction
D nodal rhythm without retrograde conduction
E nodal rhythm with retrograde conduction with abnormalities of the S T segments

30 YEAR OLD MALE SUDDEN PAIN IN CHEST, SWEATING WEAKNESS AND SHORTNESS OF BREATH



The electrocardiogram is

- A indicative of a myocardial infarct involving the lateral wall of the left ventricle
- B consistent with but not diagnostic of a left pneumothorax
- C indicative of rheumatic mitral stenosis

69 YEAR OLD WHITE MALE FAINTING SPELLS ONE DAY NO CARDIAC DRUGS



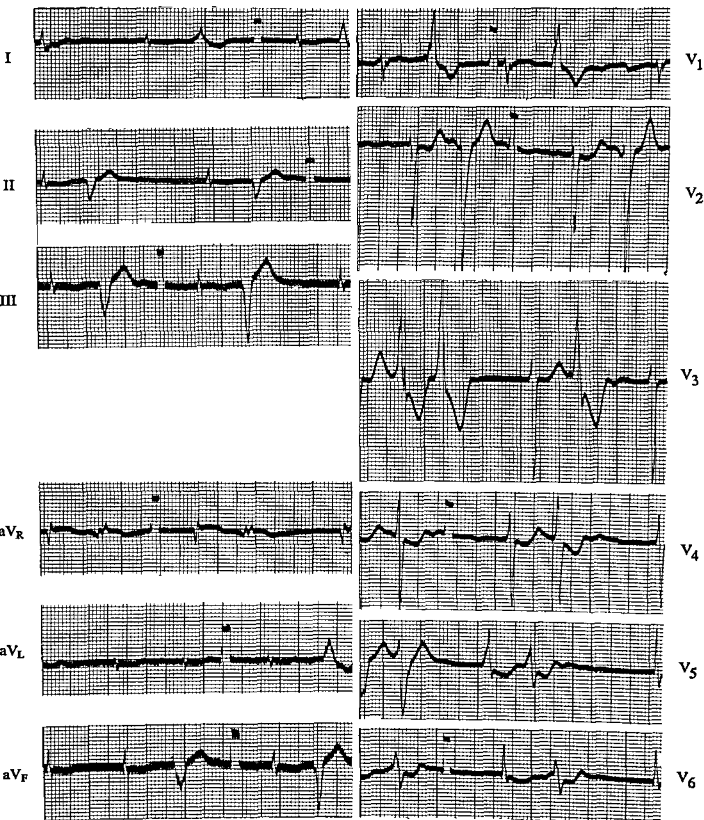
I The cardiac rhythm is

A sino atrial block
B sinus bradycardia
C sinus arrest
D intraventricular block

II The following is present

A a nodal escape beat without retrograde conduction
B a ventricular escape beat
C a nodal escape beat with retrograde conduction

70 YEAR OLD FEMALE UNABLE TO BREATHE WHEN SUPINE TAKING DIGITALIS LEAF 0 1 GM DAILY



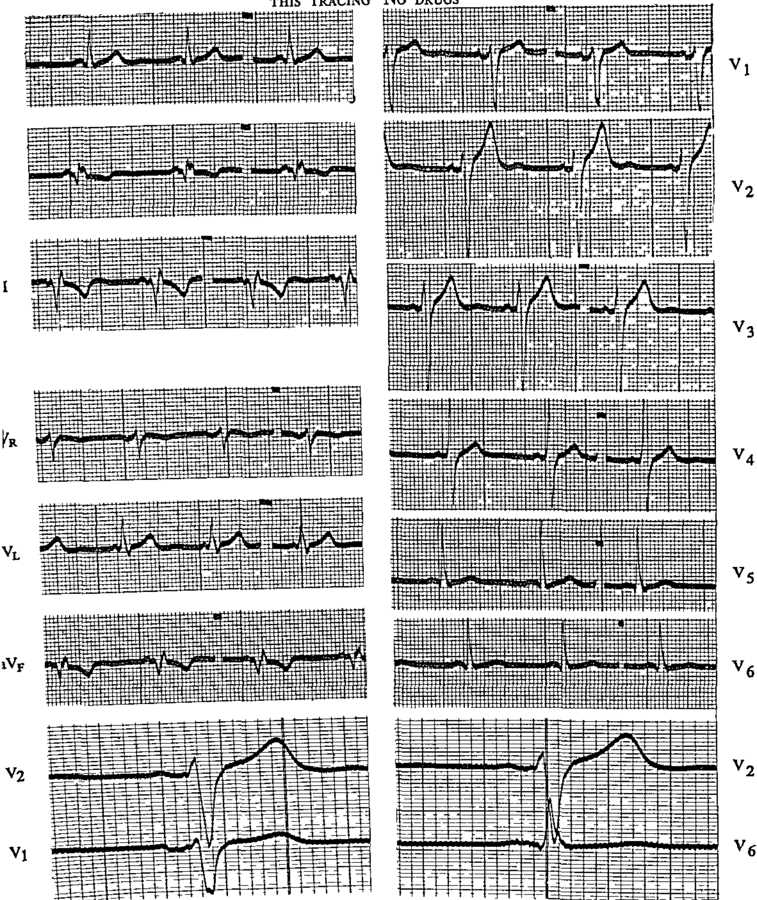
I The following artifact is present

A muscle tremor
B interfering alternating current and incorrect standardization
C loose filaments in vacuum tube

II The rhythm is

A atrial fibrillation
B atrial fibrillation and multifocal ventricular ectopic beats
C atrial fibrillation and ventricular and atrial premature contractions

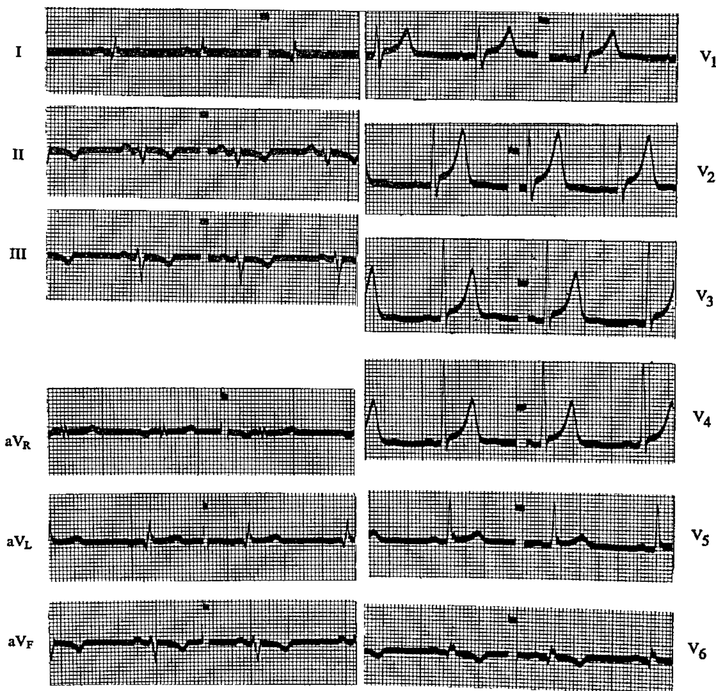
54 YEAR OLD MALE MECHANIC CHEST PAIN LASTING ONE HOUR EIGHT MONTHS PRIOR TO THIS TRACING NO DRUGS



The tracing indicates the presence of

A an old posterior myocardial infarct with peri infarction block
B a left typical complete bundle branch block
C a false bundle branch block (Wolff Parkinson White)
D a recent posterior myocardial infarct

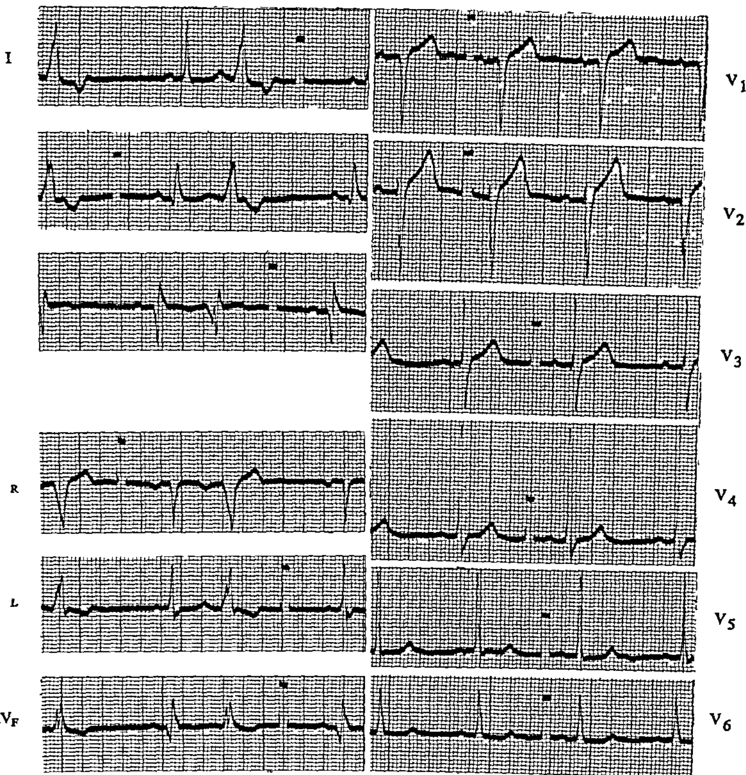
55 YEAR OLD MALE SUBSTERNAL PAIN RADIATING TO BACK TEN MONTHS AGO
HANDS STIFF FOR EIGHT MONTHS



The tracing is suggestive of

A anterior myocardial ischemia
B anterior myocardial infarct
C posterior myocardial ischemia with a posterolateral myocardial infarct
D no heart disease

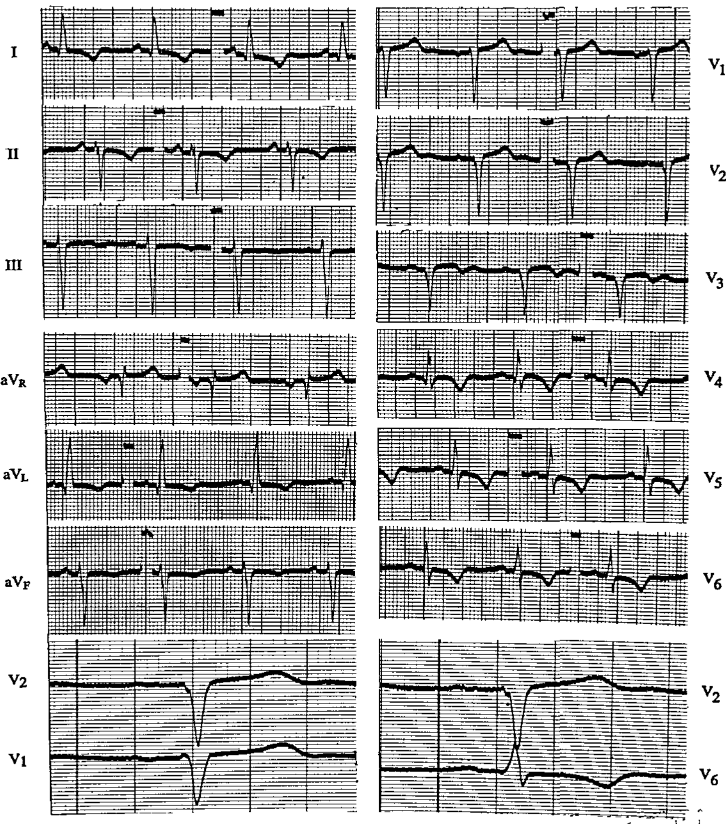
58 YEAR OLD MALE CHEST PAIN SIX MONTHS AGO



The following is present

- A a posterior infarct without other abnormalities
- B a posterior infarct and ventricular ectopic beats without other abnormalities
- C a posterior infarct with ventricular ectopic beats and local intraventricular block
- D anomalous atrioventricular conduction (Wolff Parkinson White)

65 YEAR OLD MALE CHEST PAIN FOUR MONTHS AGO NO CARDIAC DRUGS



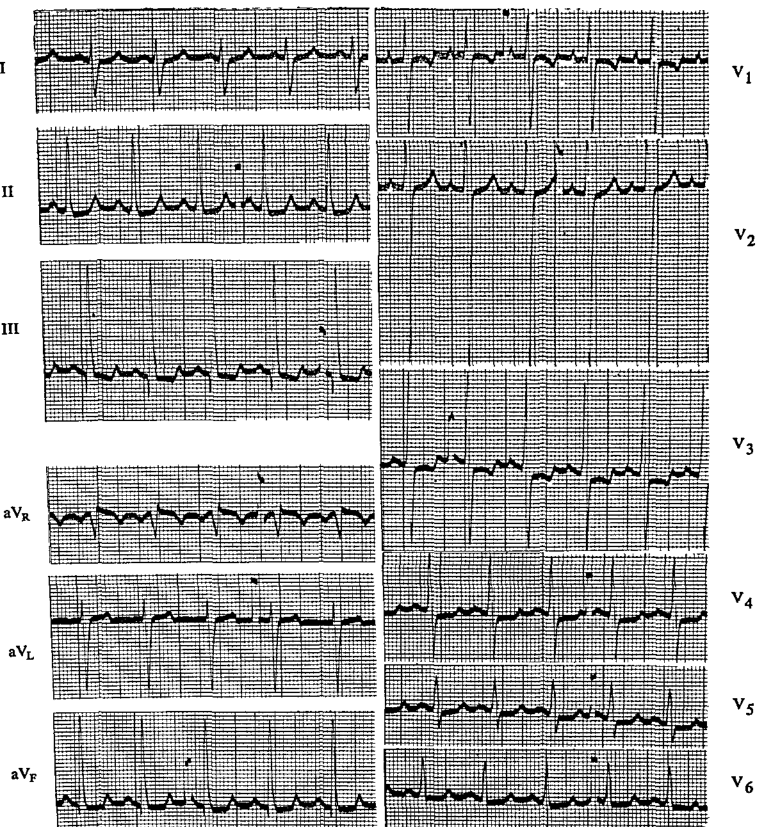
The tracing suggests

A ischemia involving the anteroseptal lateral and posterolateral aspect of the left ventricle

B necrosis of a large part of the anteroseptal lateral and posterolateral aspects of the left ventricle

C necrosis or myocardial death of the anteroseptal portion of the left ventricle with anteroseptal lateral and posterolateral myocardial ischemia

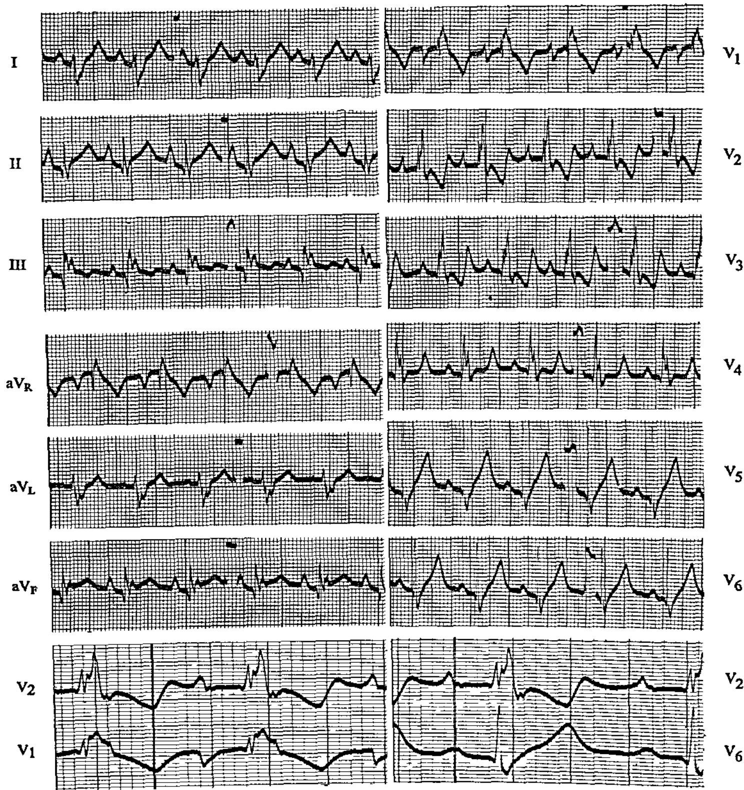
30 YEAR OLD FEMALE SHORTNESS OF BREATH FIFTEEN YEARS NO DIGITALIS



The tracing suggests

A right ventricular hypertrophy without left ventricular hypertrophy
B left ventricular hypertrophy without right ventricular hypertrophy
C right and left ventricular hypertrophy

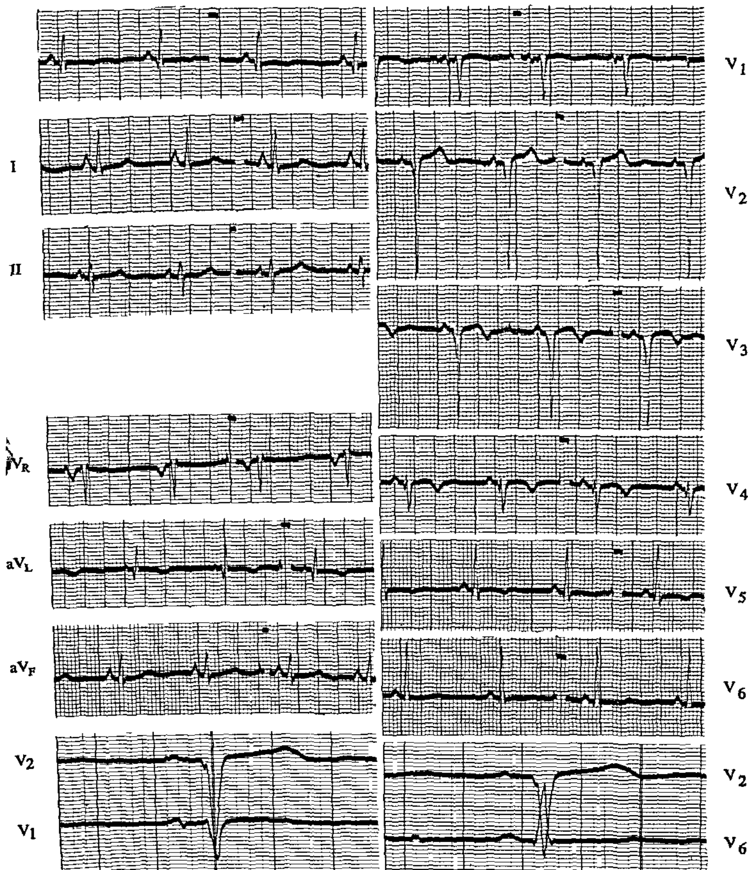
8 YEAR OLD BOY SHORTNESS OF BREATH ON EXERTION NO CARDIAC DRUGS



The electrocardiogram is in keeping with the following disease state

A uncomplicated ventricular septal defect
B Ebstein s syndrome
C tricuspid stenosis
D aortic valve disease

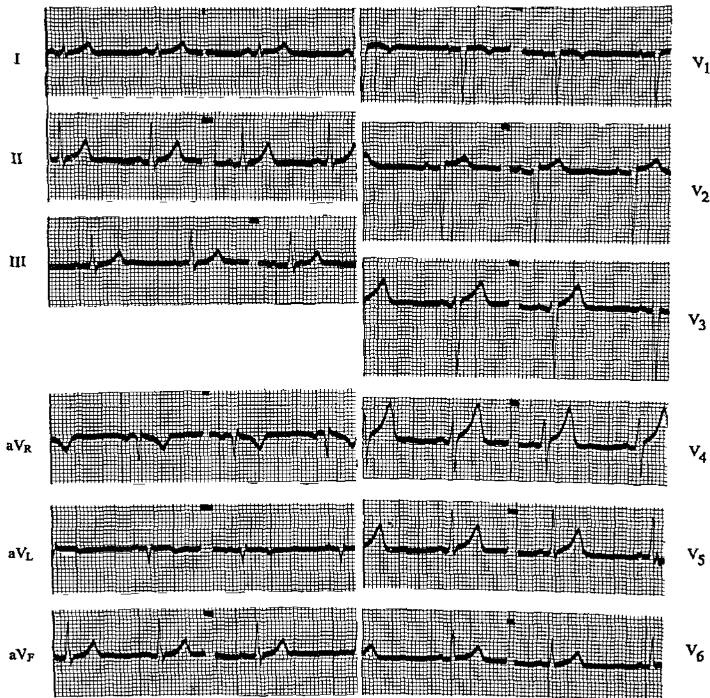
58 YEAR OLD FEMALE CHEST PAIN AT REST AND ON EFFORT



The tracing is typical of

A an acute (few hours) anterolateral myocardial infarct
B a subacute or chronic (weeks or months) anterolateral myocardial infarct
C anteroseptal myocardial ischemia without infarction
D an incomplete left bundle branch block

33 YEAR OLD MALE GENERAL CHECK UP NO DRUGS



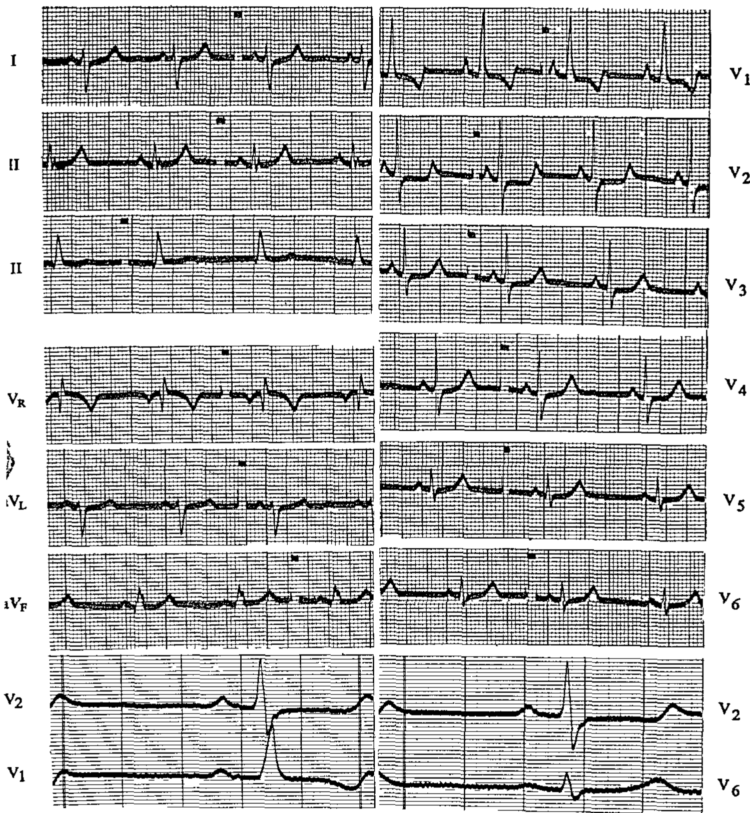
I The inverted T waves in lead aV$_L$ *are*

A indicative of ischemia of the lateral wall of the left ventricle
B indicative of a lateral myocardial infarct
C within normal limits

II The electrocardiographic position is

A horizontal
B semihorizontal
C intermediate
D indeterminate
E vertical

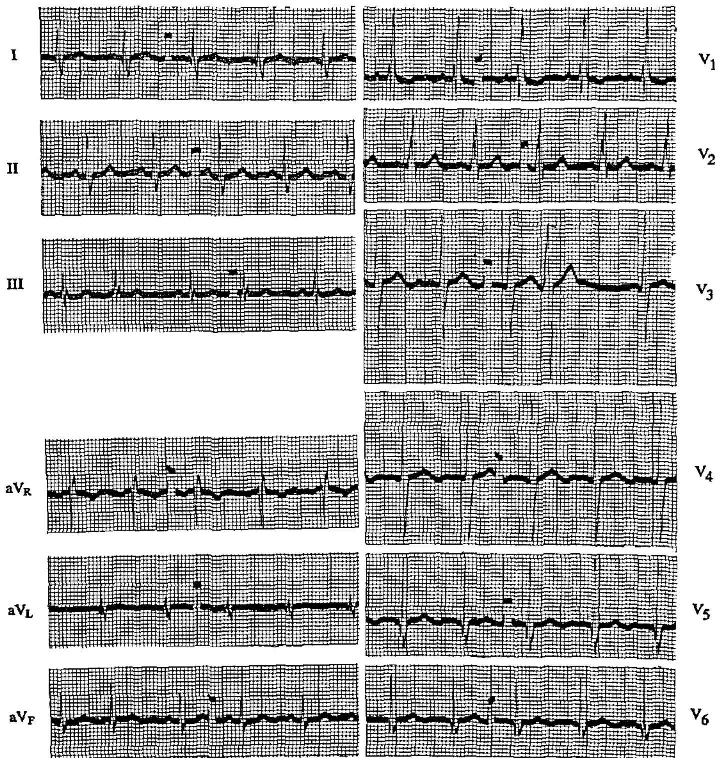
32 YEAR OLD FEMALE SHORTNESS OF BREATH TEN YEARS NO CARDIAC DRUGS



The tracing is most consistent with the following condition

A dextrocardia not associated with other cardiac abnormalities
B severe pulmonary valvular stenosis
C acute cor pulmonale
D aortic valve disease

15 YEAR OLD FEMALE HEIGHT 68 INCHES WEIGHT 75 POUNDS CARDIAC CHECK UP



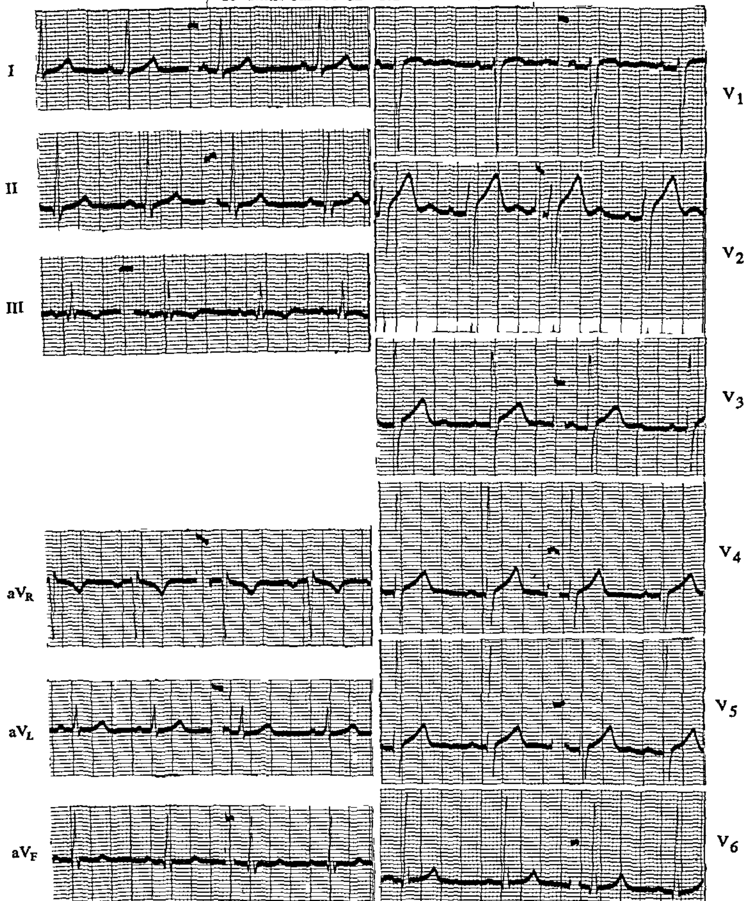
The following is present

A an incomplete right bundle branch block without other abnormalities

B an incomplete right bundle branch block and right ventricular hypertrophy without other abnormalities

C an incomplete right bundle branch block right ventricular hypertrophy and a ventricular ectopic beat

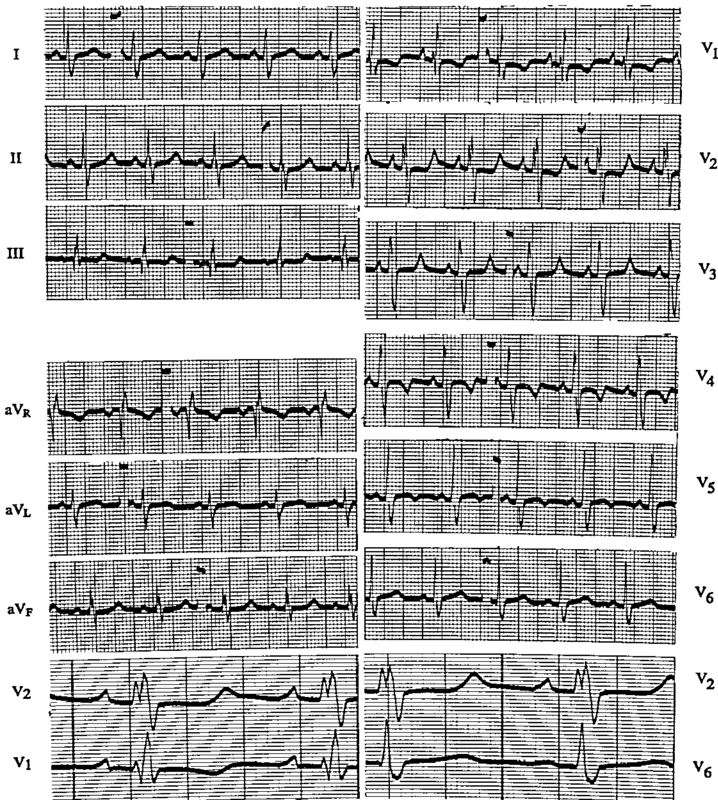
15 YEAR OLD MALE CARDIAC CHECK UP



The tracing is consistent with but not diagnostic of

- A left ventricular hypertrophy
- B right ventricular hypertrophy
- C left and right ventricular hypertrophy
- D a left incomplete bundle branch block

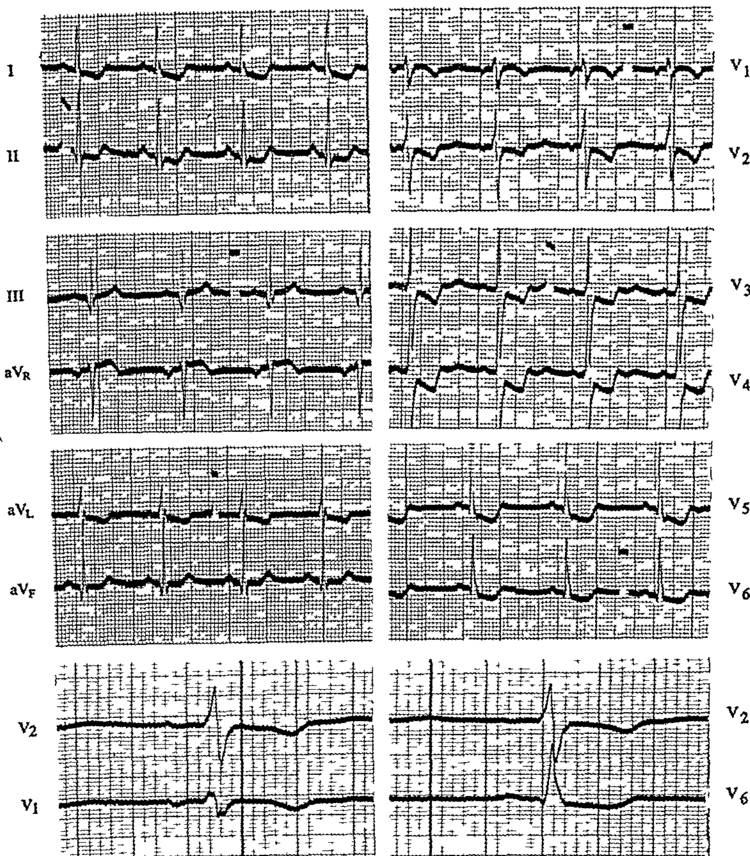
13 YEAR OLD GIRL SHORTNESS OF BREATH SINCE BIRTH HEIGHT 52 INCHES WEIGHT 85 POUNDS



The tracing suggests

- A a false bundle branch block (Wolff Parkinson White)
- B an incomplete right bundle branch block
- C a left bundle branch block
- D a partial atrioventricular block

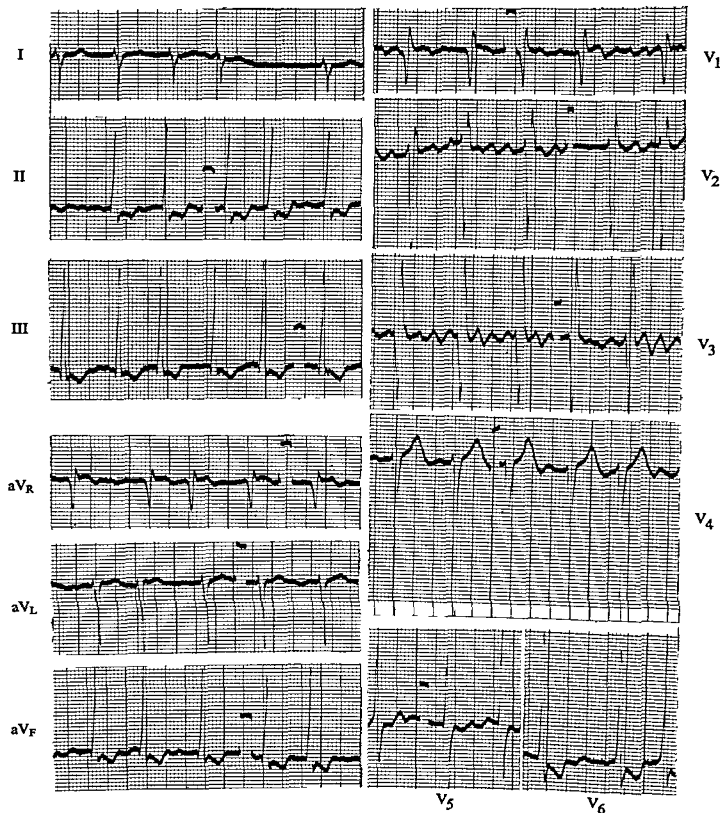
67 YEAR OLD FEMALE WEIGHT 160 POUNDS DIGITALIS LEAF 0.1 GM DAILY FOR ONE YEAR



The S T segments are characteristic of

- A hyperkalemia
- B hypocalcemia
- C digitalis in subtherapeutic doses without myocardial injury and ischemia
- D procaine amide
- E therapeutic or excessive doses of digitalis and miocardial injury and ischemia

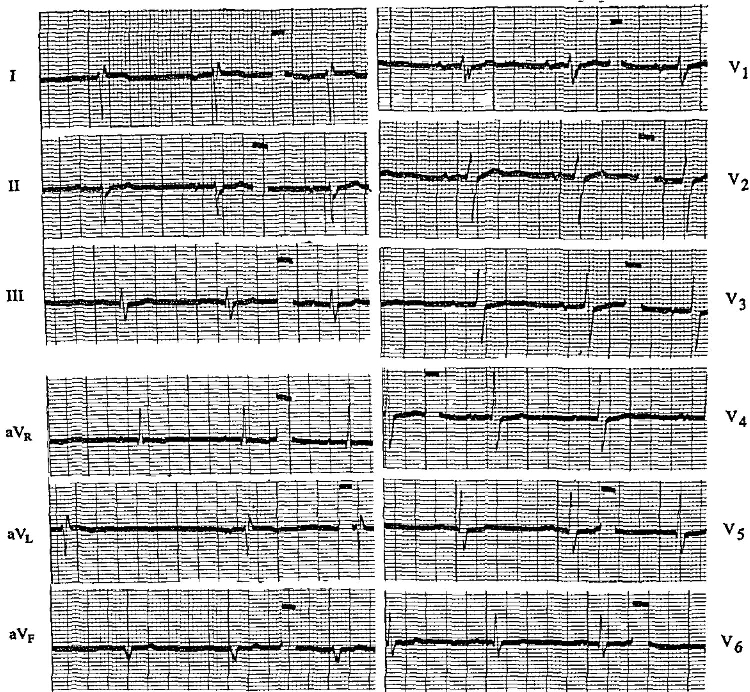
49 YEAR OLD FEMALE SHORTNESS OF BREATH DIGITALIS 0 2 GM DAILY



The electrocardiogram is consistent with the following clinical states

A mitral stenosis and insufficiency
B subaortic stenosis
C patent ductus arteriosus without other abnormalities

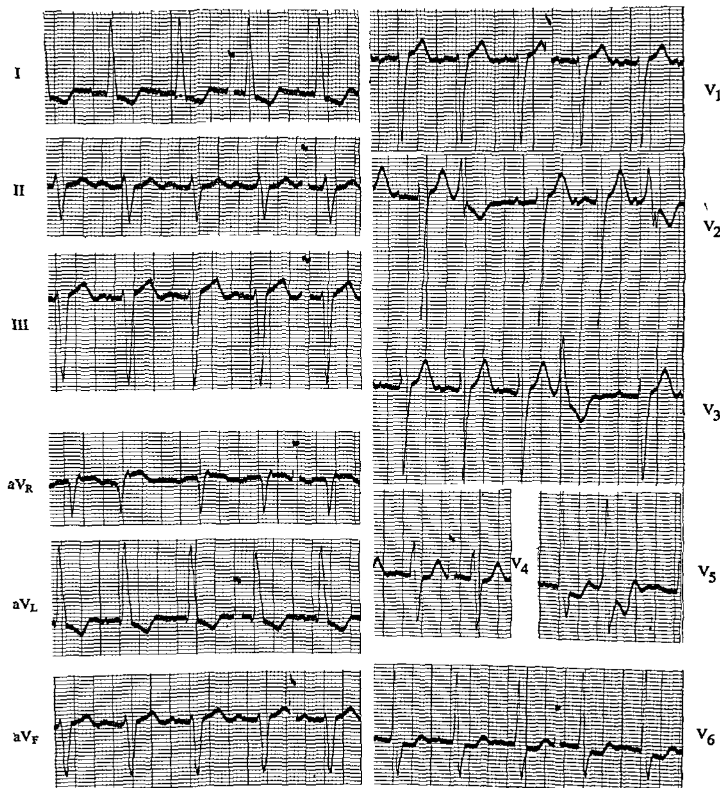
72 YEAR OLD MALE PHYSICIAN CHEST PAIN FOR SEVEN DAYS NO CARDIAC DRUGS



The following is present

- A dextrocardia
- B right ventricular hypertrophy
- C switching of the lead I wires when applied to the patient s arms
- D a right complete bundle branch block

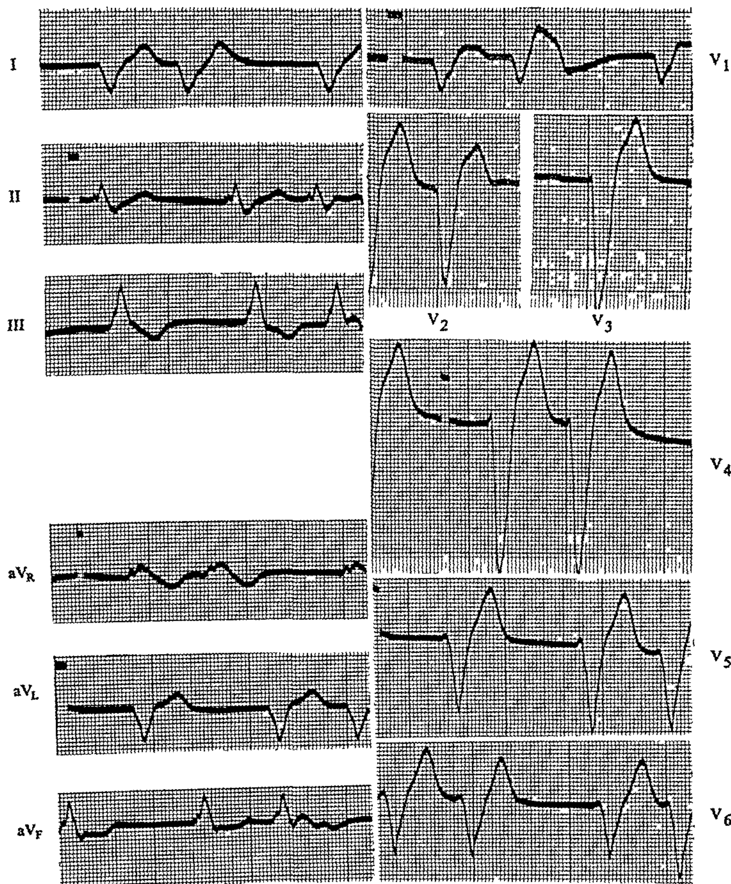
68 YEAR OLD FEMALE CHEST PAIN ON EFFORT ONE YEAR NO DIGITALIS



The tracing suggests the following (select more than one if desired)

- A a complete left bundle branch block
- B an incomplete left bundle branch block
- C a partial AV block without dropped beats
- D nodal premature contractions
- E ventricular premature contractions

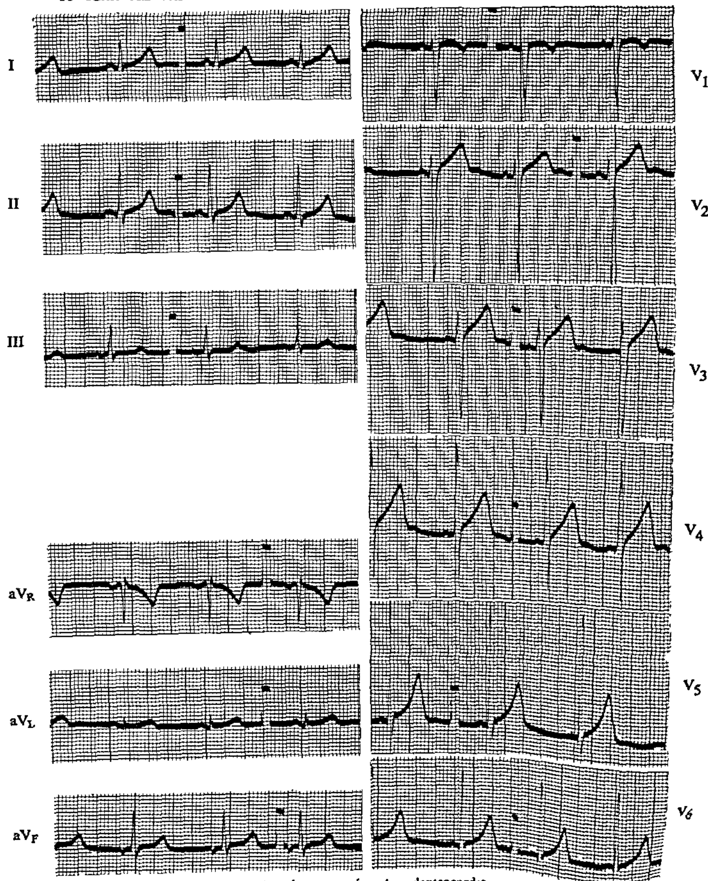
60 YEAR OLD MALE CHEST PAIN TWO DAYS



The tracing is suggestive of

A a left typical complete uncomplicated bundle branch block
B a right complete uncomplicated bundle branch block
C an intraventricular block associated possibly with a dying heart or with hyperkalemia
D severe hypokalemia √

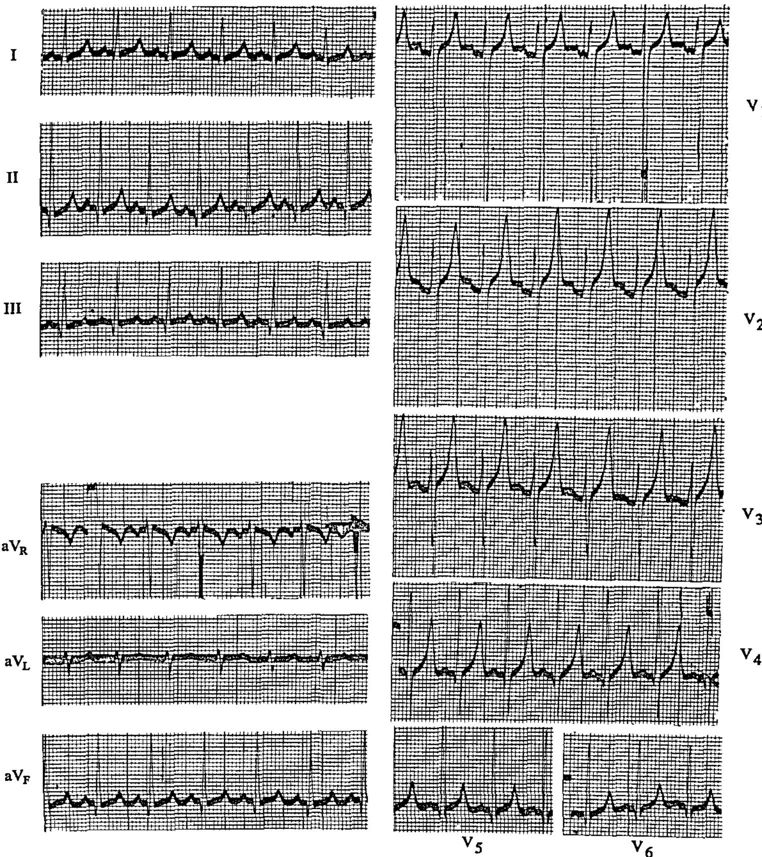
13 YEAR OLD JAPANESE SCHOOLBOY CARDIAC MURMUR SINCE BIRTH NO DRUGS



The tracing is in keeping with a diagnosis of

A dextrocardia
B Ebstein's syndrome
C uncomplicated tetralogy of Fallot
D small ventricular septal defect
E large atrial septal defect

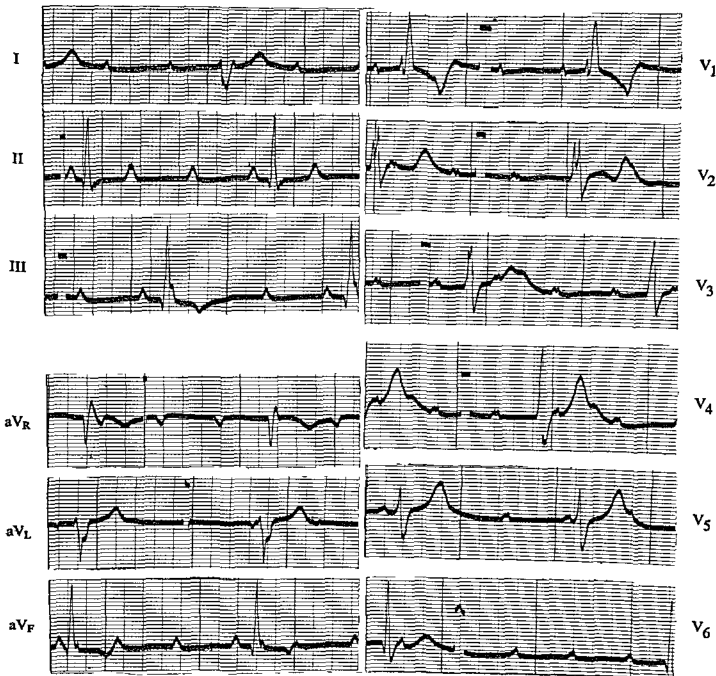
28 YEAR OLD WHITE MALE WEAKNESS OF TWO MONTHS DURATION NO CARDIAC COMPLAINTS



The tracing suggests

A anterior subepicardial ischemia
B hypokalemia
C hyperkalemia
D hypocalcemia
E hypercalcemia

45 YEAR OLD MALE SLOW PULSE RATE FIRST DISCOVERED AT AGE 8



The following is present

- A sino atrial block
- B interference dissociation
- C complete AV block with idioventricular rhythm✓
- D a right incomplete bundle branch block
- E a right complete bundle branch block
- F a complete AV block with nodal rhythm

PART B

QUESTIONS ON ELECTROCARDIOGRAPHIC INTERPRETATION

ARRHYTHMIAS

1 *Atrial fibrillation is characterized by*

A the absence of clearly distinguishable P waves and irregular R R intervals
B R R intervals which show phasic variations with respiration
C clearly defined P waves of similar configuration with variable P R intervals

2 *Atrial fibrillation usually has an atrial rate*

A which exceeds 300 beats per minute
B is less than 200 beats per minute
C is less than 100 beats per minute

3 *Atrial fibrillation or flutter usually but not invariably is associated with demonstrable disease in the heart or somewhere in the body*

A True
B False

4 *Atrial fibrillation is*

A usually accompanied by an irregular ventricular rhythm
B seldom accompanied by an irregular rhythm

5 *Atrial flutter when untreated commonly has a rate of*

A 450 beats per minute
B 300 beats per minute ✓
C 150 beats per minute
D 100 beats per minute

6 *Atrial tachycardia is characterized by*

A a rapid atrial rate often with nearly regular P P intervals
B absolute irregularity of atrial contraction
C a gradual slowing of atrial contractions following breath holding or deep breathing

7 *When atrial tachycardia changes to sinus rhythm the conversion usually takes place*

A gradually
B abruptly

8 *Paroxysmal atrial tachycardia with block frequently results from*

A epinephrine injection
B extreme physical exertion
C digitalis intoxication
D hyperthyroidism

9 *Paroxysmal atrial tachycardia is*

A pathognomonic of organic cardiac disease
B good evidence of organic cardiac disease
C not in itself indicative of organic cardiac disease

10 *Paroxysmal tachycardia may be atrial nodal or ventricular*

A True
B False

11 *Electric alternation always accompanies pulsus alternans*

A True
B False

12 *A nodal escape*

A occurs commonly with sinus arrest when the atrioventricular node assumes control for one or more beats
B describes slow rhythms of ventricular origin when retrograde conduction into the atria occurs
C describes a nodal rhythm where QRS precedes an inverted P wave

13 *AV nodal rhythm with retrograde conduction is characterized typically by*

A positive P waves in lead II
B inverted P waves in lead aV_F
C positive P waves in leads I and aV_F

14 *Nodal rhythm is caused by a periodic discharge from the*

A sinus node
B atrioventricular node

15 *With nodal rhythm with retrograde conduction the P waves*

A always precede the QRS complexes
B always follow the QRS complexes
C always fall within the QRS complexes
D may precede, fall within or follow the QRS complexes

16 *Nodal tachycardia with retrograde conduction is characterized by*

A rapid regular atrial contractions occurring at a rate greater than 100 beats per minute with inverted P waves in leads II III and aV_F
B an atrial rate between 60 and 100 beats per minute with inverted P waves in leads II III and aV_F
C an atrial rate over 100 beats per minute with positive P waves in lead aV_F

17 *Nodal rhythm is*

A always accompanied by retrograde conduction through the atria
B not always accompanied by retrograde conduction through the atria

18 *With parasystole the interval in seconds between any two complexes produced by the ectopic pacemaker will be divisible by a common denominator and results in a whole number as a quotient*

A True
B False

19 *Sinus arrest usually is*

A a functional arrhythmia characterized by temporary cessation of activity of the sinus node
B produced by organic disease of the sino atrial node and is associated with long periods of atrial standstill

20 *Phasic sinus arrhythmia is present when the cardiac rate varies with*

A respiration and the pacemaker is in the sinus node
B exercise when the pacemaker is outside the sinus node

21 *Phasic sinus arrhythmia is in itself*

A diagnostic of cardiac disease
B not diagnostic of cardiac disease

22 *Sinus bradycardia is diagnosed when the cardiac rate is*

A less than 60 beats per minute and the pacemaker is in the sinus node
B between 60 and 100 beats per minute and the pacemaker is in the sinus node
C less than 60 beats per minute with the pacemaker in the atrioventricular node

23 *The cardiac rate normally varies*

A inversely with age from birth to adulthood (the older the age the slower the rate)
B directly with age from birth to adulthood

24 *Normal sinus rhythm is diagnosed when the pacemaker is*

A in the sinus node and the cardiac rate is from 60 to 100 beats per minute
B in the atrioventricular node and the cardiac rate is from 60 to 100 beats per minute
C in the sinus node and the cardiac rate exceeds 100 beats per minute

25 *Sinus tachycardia as a general rule*

A does not exceed 160 beats per minute
B often exceeds 180 beats per minute
C falls between 60 and 100 beats per minute

26 *Sinus tachycardia is*

A diagnostic of hyperthyroidism
B suggestive of hypothyroidism
C consistent with a normal heart as well as with cardiac and other disease states

27 *Supraventricular tachycardia includes*

A sinus atrial or nodal tachycardia and atrial fibrillation or flutter
B atrial fibrillation or atrial flutter only
C sinus atrial or nodal tachycardia only

28 *Ventricular fibrillation is characterized by*

A irregular R R intervals and wide QRS complexes which are irregular in amplitude and duration and which are not regularly preceded by P waves
B regular wide QRS complexes preceded by P waves
C QRS complexes of normal width and configuration

✓ 29 *Multiple ventricular ectopic beats are diagnosed when two or more ventricular ectopic beats of similar size configuration and polarity are present*

A True
B False

30 *Multifocal ventricular ectopic beats are diagnosed when in a lead two or more ventricular ectopic beats*

A differ from each other in size configuration or polarity
B are similar in size configuration and polarity

31 *Ventricular premature contractions characteristically are*

A preceded by P waves
B not preceded by P waves

32 *Ventricular premature contractions recorded with the subject at rest are*

A diagnostic of organic myocardial disease
B not in themselves diagnostic of organic myocardial disease

33 *Ventricular ectopic beats arising from the base of the heart are in the three standard leads predominately*

A negative
B positive
C biphasic

√34 *Bigeminy is characterized by groups of two beats consisting of*

A a normal beat and a ventricular ectopic beat
B a normal beat and an atrial premature beat
C any combination of coupled beats

35 *Premature beats of ventricular origin*

A always indicates myocardial disease
B frequenly occur in the absence of demonstrable cardiac disease

36 *Ventricular tachycardia is usually regular but at times may show slight irregularity of the R R intervals*

A True
B False

37 *One of the requirements for ventricular tachycardia is*

A a pacemaker in a ventricle which sends out a series of successive ventricular contractions
B ventricular ectopic beats which show retrograde conduction
C ventricular ectopic beats which fail to show retrograde conduction

ARTIFACTS

38 *When the right arm and left arm lead wires have been attached incorrectly to the arms (lead I lines interchanged) the three standard leads can be corrected by viewing*

A lead I as its mirror image and interchanging leads II and III
B lead III as the mirror image and interchanging leads I and II

39 *When the left arm and left leg wires have been attached incorrectly to these limbs while form ing the lead III connection (lead wires interchanged) the standard leads can be corrected by viewing*

A lead III as its mirror image and interchanging leads I and II
B lead II as its mirror image and interchanging leads I and III

40 *When the right arm and left leg lead wires have been attached incorrectly to these limbs when forming the connections for lead II (lead wires interchanged) the standard leads can be cor rected by viewing*

A all leads as their mirror images and interchanging leads I and III
B lead II as the mirror image and by interchanging leads I and III

41 *Negative P QRS and T waves in lead I with P waves preceding and T waves following QRS complexes suggests*

A typical right bundle branch block
B typical right ventricular enlargement
C dextrocardia or reversal of the right arm and left arm lead wires when making the lead I connection
D a lead mounted upside down

CONDUCTION DEFECTS

42 *A first degree AV block is*

A diagnostic of rheumatic heart disease
B diagnostic of ischemia of the AV node
C not diagnostic of any specific state

43 *A first degree block (prolonged P R interval) usually indicates changes in the*

A sinus node
B atrioventricular node
C bundle of His

44 *a complete atrioventricular block is characterized by QRS complexes which*

A are never wider than 0 12 second
B are always wider than 0 12 second
C may be of normal duration or prolonged

45 *A complete AV block with idioventricular rhythm indicates the presence of a block in the*

A sinus node
B atrioventricular node
C bundle of His

46 *The Wenckebach phenomenon is a type of*

A complete AV block
B incomplete AV block with dropped beats
C incomplete AV block without dropped beats

47 *The Wenckebach phenomenon is*

A progressive lengthening of P R interval with eventual dropping of a ventricular beat
B excessive sinus arrhythmia not respiratory in origin
C progressive lengthening of P R with dropping of a ventricular beat after every second wave
D cyclic variations in P R without dropping of beats

48 *Anomalous atrioventricular conduction (Wolff Parkinson White)*

A is never associated with organic cardiac disease
B is always associated with organic cardiac disease
C may or may not be associated with organic cardiac disease

49 *Anomalous atrioventricular conduction (Wolff Parkinson White) is characterized by*

A short P R intervals and wide QRS complexes
B prolonged P R intervals and QRS complexes of short duration
C long P R intervals and slurring of QRS complexes

50 *Which of the following is most consistent with typical complete left bundle branch block?*

A Q waves in lead I
B QRS complexes which measure from 0 10 to 0 12 second
C QS waves in leads V_1 and V_2 with QRS complexes which are greater than 0 12 second in duration

51 *In the presence of a left bundle branch block QS waves in leads V_5 and V_6*

A suggest a myocardial infarct
B rule out a myocardial infarct
C suggest left ventricular hypertrophy

52 *In typical left bundle branch block the J point S T segments and T waves are usually*

A concordant with the major deflections of the QRS complexes
B discordant with the major deflections of the QRS complexes

53 *A right bundle branch block may be a congenital abnormality*

A True
B False

54 *An incomplete right bundle branch block in the electrocardiogram suggests interruption of some of the fibers of the right bundle of His*

A True
B False

55 *In the presence of a right bundle branch block large Q waves in leads* V_3 V_4 *and* V_5 *suggest*

A an anterior myocardial infarct
B a posterior myocardial infarct
C right ventricular hypertrophy

56 *In the presence of a right bundle branch block elevated J points and coved S T segments with inverted T waves in leads* V_3 V_4 *and* V_5 *which persist for 24 hours or more suggest*

A an anterior myocardial infarct or pericarditis
B posterior myocardial ischemia
C pulmonary infarction

57 *The prognosis with a complete right bundle branch block generally is*

A more favorable than with a complete left bundle branch block
B less favorable than with a left bundle branch block

58 *Incomplete right bundle branch block is common when lead* V_3R *or* V_1 *shows an rSR prime wave with the onset of the intrinsicoid deflection of the R prime wave from*

A 0 035 to 0 05 second
B 0 05 to 0 075 second
C 0 08 second or greater

59 *A right bundle branch block makes it impossible to diagnose a large postero inferior myocardial infarct*

A True
B False

60 *Sino auricular block may be due to*

A epinephrine
B atropine
C digitalis
D theophylline

DISEASE STATES+

(CONGENITAL AND ACQUIRED)

61 *The electrocardiogram is diagnostic of at least one of the following types of congenital heart diseases*

A Tetralogy of Fallot
B Eisenmenger s complex
C Dextrocardia
D Interatrial septal defect

62 *Uncomplicated atrial septal defects of significant size generally are characterized by electro cardiographic evidence of*

A right ventricular hypertrophy or right bundle branch block
B left ventricular hypertrophy
C left bundle branch block

63 Ventricular septal defects uncomplicated by other congenital abnormalities produce no ab normalities in the tracing if the defect is small however if it is large there may be evidence of left or right or left and right ventricular hypertrophy

A True
B False

64 Large or many pulmonary veins emptying into the right atrium generally result in the electro cardiographic picture of

A left ventricular hypertrophy
B right ventricular hypertrophy
C left bundle branch block

65 Transposition of the great vessels results in the electrocardiographic picture of pure left ven tricular hypertrophy without right ventricular hypertrophy

A True
B False

66 The electrocardiogram of Ebstein s syndrome suggests

A right atrial and left ventricular hypertrophy
B left atrial hypertrophy in the absence of right ventricular hypertrophy
C right atrial hypertrophy and right complete bundle branch block or intraventricular block

67 The electrocardiogram from a patient with a patent ductus arteriosus which is uncomplicated by other abnormalities typically

A is normal or shows evidence of left ventricular hypertrophy
B shows evidence of right ventricular hypertrophy without left ventricular hypertrophy

68 Coarctation of the aorta in the adult shows usually

A a left ventricular hypertrophy pattern or occasionally a normal electrocardiogram
B right bundle branch block
C right ventricular hypertrophy

69 Tricuspid atresia with a nonfunctioning right ventricle and an interatrial septal defect charac teristically produces

A a right ventricular hypertrophy pattern
B a left ventricular hypertrophy pattern
C a normal electrocardiogram

70 Truncus arteriosus existing as an uncomplicated entity is associated with a left ventricular hypertrophy pattern

A True
B False

71 The tetralogy of Fallot without a ductus arteriosus or other additional abnormalities charac teristically shows

A a left ventricular hypertrophy pattern
B a left bundle branch block
C a right ventricular hypertrophy pattern

72 Pulmonary stenosis with intact atrial and ventricular septa shows characteristically

A right ventricular hypertrophy or occasionally a normal electrocardiogram
B left ventricular hypertrophy
C right and left ventricular hypertrophy

73 *Rheumatic mitral stenosis frequently shows a vertical electrocardiographic position of the heart with wide notched P waves in leads I and II or atrial fibrillation*

A True
B False

74 *Aotic stenosis and insufficiency usually are characterized by*

A left ventricular hypertrophy
B right ventricular hypertrophy
C no ventricular hypertrophy

75 *The electrocardiogram is always abnormal with disseminated lupus erythematosus*

A True
B False

76 *P waves in pulmonary emphysema often are*

A wide and notched in leads I II and aV_L
B wide and notched in leads II III and aV_F
✓C tall and pointed in leads II III and aV_F
D tall and pointed in leads I II and aV_L

77 *Severe hyperthyroidism produces often*

A complete atrioventricular block
B sinus bradycardia
C *atrial fibrillation or atrial flutter*

78 *Severe hypothyroidism produces often*

A complete atrioventricular block
B sinus bradycardia
C atrial fibrillation or atrial flutter

DRUGS AND ELECTROLYTES

79 *Digitalis in digitalizing doses typically produces*

A short Q T intervals
B no change in Q T intervals
C long Q T intervals

80 *Digitalis therapy may result in*

A prolongation of P R interval but not in higher degrees of AV block
B a complete AV block
C an intraventricular conduction delay

81 *Digitalis usually slows the ventricular rate significantly in patients with*

A atrial fibrillation
B tachycardia due to toxic states or infections if congestive heart failure is not present

82 *Digitalis shifts the J point in most leads*

A *opposite to the major deflections of the QRS complexes*
B in the same direction as the major deflections of the QRS complexes

83 *Quinidine characteristically*

A shortens Q T intervals
B lengthens Q T intervals
C does not alter Q T intervals

84 *Quinidine characteristically*

A converts atrial fibrillation to sinus rhythm
B produces sinus arrhythmia
C shortens the duration of QRS complexes

85 *Quinidine increases the ventricular rate in certain patients with atrial flutter*

A True
B False

86 *Hypocalcemia of severe degree produces*

A short Q T intervals
B long Q T intervals
C no change in Q T intervals

87 *In hypokalemia*

A Q T intervals are prolonged and U waves are prominent
B *T waves are generally tall and upright*
C Q T intervals are shortened
D QRS increases in length

88 *Hyperkalemia is associated with*

A tall peaked T waves
B decreased duration of QRS complexes
C long Q T or long Q U intervals

89 *Large U waves are a common finding with*

A hyperkalemia
B hypokalemia
C rapid cardiac rates
D hypernatremia

90 *The electrocardiogram is a highly reliable index of the blood potassium level under all circumstances*

A True
B False

ELECTRIC AXIS

91 *The mean electric axis of the QRS complexes is normally*

A less positive in infants than in children
B more positive in infants than in children
C essentially the same in infants and children

92 *Right axis deviation of the QRS complexes greater than 90 degrees is found commonly in patients with dextrocardia tetralogy of Fallot Eisenmenger's complex significant pulmonary stenosis significant atrial septal defect or Lutembacher's syndrome*

A True
B False

93 *Left axis deviation or a tendency to left axis deviation of the QRS complexes is present characteristically in adults with significant coarctation of the aorta and in patients with hypogenesis of the right ventricle or with tricuspid stenosis associated with atrial septal defect*

A True
B False

94 *Normally the mean electric axis of the T waves*

A is opposite to the mean electric axis of the QRS complexes
B follows in general that of the mean electric axis of the QRS complexes

HYPERTROPHY

(ATRIAL AND VENTRICULAR)

95 *Left atrial hypertrophy is characterized often by*

A narrow tall peaked unnotched P waves of similar configuration in leads II and III
B wide notched P waves in leads I and II
C inverted P waves in leads II III and aV_F

96 *Right atrial hypertrophy is characterized often by*

A broad notched P waves in leads I and II
B narrow tall peaked P waves of similar configuration in leads II and III
C inverted P waves in leads II III and aV_F

97 *Left ventricular hypertrophy is characterized by high voltage of the R waves in lead aV_L with J points S T segements and T waves which are opposite to the major deflections of the QRS complexes*

A True
B False

98 *The average of the electric forces present during ventricular depolarization in a subject with left ventricular hypertrophy is often from the A V node toward the*

A left shoulder and back of the body
B right shoulder and back
C left shoulder and front

99 *The R waves in lead V_4 with left ventricular hypertrophy characteristically are*

A tall and often exceed 27 0 mm
B short

100 *The time of onset of the intrinsicoid deflections in lead V_6 with left ventricular hypertrophy is often*

A as long as 0 06 second
B longer than 0 12 second
C longer than 0 16 second

101 *Right ventricular hypertrophy is characterized by*

A tall R waves in leads V_3 V_4 and V_5
B tall R waves in leads V_1 and V_2
C deep S waves in leads V_1 and V_2

102 *Left ventricular hypertrophy*

A always causes a shift of the mean QRS axis to the left
B is recognizable with a normal mean electric axis of the QRS complexes
C is a frequent cause of a right axis deviation of QRS complexes

✓103 *All of the following criteria are in keeping with right ventricular hypertrophy*

1 a QR pattern in lead V_{3R} or V_1
2 R waves in lead V_1 which exceed 7 0 mm in amplitude
3 R/S ratios in lead V_1 greater than 1 0
4 ventricular activation times in lead V_1 of 0 035 to 0 05 second
A True
B False

• 104 *In right ventricular hypertrophy the transitional zone in the 6 precodial leads characteristically is shifted*

A to the right
B to the left

• 105 *Right ventricular hypertrophy in the presence of a right complete bundle branch block*

A produces large R prime waves in lead V_1
B does not influence the height of the R prime waves in lead V_1

INTRINSICOID DEFLECTION

106 *A delayed onset of the intrinsicoid deflections in lead* V_5 *indicates often*

A left bundle branch block and excludes delayed intraventricular conduction
B delayed intraventricular conduction and excludes left bundle branch block
C left bundle branch block or delayed intraventricular conduction

107 *The intrinsicoid deflections are read generally from*

A the standard leads
B unipolar chest leads
C unipolar extremity leads

108 *The intrinsicoid deflections recorded from the precordium over the left ventricle normally occur*

A earlier than those recorded from the precordium over the right ventricle
B later than those recorded from the precordium over the right ventricle

109 *In a left bundle branch block and in left ventricular hypertrophy the time of onset of the intrinsicoid deflections in lead* V_6 *is*

A delayed
B shortened
C normal

110 *In right bundle branch block and right ventricular hypertrophy the time of onset of the intrinsicoid deflections in lead* V_1 *characteristically is*

A delayed
B shortened
C normal

LEADS

111 *Lead I measures the differences in potential between*

A the left and right arm
B right arm and left leg
C left arm and left leg

112 *Lead II measures the differences in potential between the*

A right arm and left arm
B left leg and right arm
C left arm and left leg

113 Lead III measures the differences in potential between the

A right arm and left arm
B right arm and left leg
C left leg and left arm

114 An upright deflection is written in lead I when the potential at the left arm is relatively

A positive compared with that at the right arm
B negative as compared with that of the right arm
C positive as compared to the left leg

115 An upright deflection is written in lead II when the potential

A at the right arm is positive with respect to that at the left leg
B at the right arm is negative with respect to that of the left leg
C at the left arm is positive with respect to the left leg

116 An upright deflection is written in lead III when the potential

A at the left arm is positive with respect to the left leg
B at the left arm is negative with respect to the left leg
C at the right arm is negative with respect to the left leg

117 An upright deflection is written in a central terminal lead when the exploring electrode is

A positive with respect to the central terminal
B negative with respect to the central terminal
C nearly zero with respect to the central terminal

118 The limb leads aV_R aV_L *and* aV_F *record differences in potential between one lead which is nearly zero potential throughout the heart cycle and another lead placed on a limb which usually has a significant variable potential throughout the heart cycle*

A True
B False

119 The standard leads I II and III are often referred to as

A unipolar leads
B bipolar leads

120 Lead V_3 *is located*

A on a horizontal line midway between V_1 and V_2
B on a horizontal line midway between V_5 and V_6
C on a slanting line midway between leads V_2 and V_4

121 The precordial lead V_2 *is located at the junction of the*

A 4th intercostal space and the right sternal border
B 4th intercostal space and the left sternal border
C 5th intercostal space and the left sternal border
D mid clavicular line and the 4th intercostal space

122 If the heart is positioned normally in the chest (intermediate position) the V_6 *electrode usually lies over the*

A anterior aspect of the left ventricle
B posterolateral aspect of the left ventricle
C over the right ventricle

123 The V_{4R} *electrode is placed*

A on the right side of the chest but in the same relative position as the standard V_4 electrode
B on the right leg
C above the V_4 electrode

124 *The esophageal lead is of practical value in differentiating*

A atrial fibrillation from atrial tachycardia
B right from left bundle branch block
C right from left ventricular hypertrophy

125 *When the esophageal lead is placed at the atrioventricular groove and atrial depolarization occurs in a normal fashion the P waves are predominantly*

A negative
B positive
C diphastic

126 *Einthoven s equation states that at a given instant the sum of the amplitude of the waves is as follows*

A I plus III equals II
B II plus III equals I
C I plus II equals III

127 *The unipolar limb lead law states that at a given instant the amplitude of similar waves from the*

A right arm left arm and foot equals zero ($V_R + V_L + V_F = 0$)
B right arm left arm and back equals a large positive value ($V_R + V_I + V_B$ = a large positive value)
C right arm left arm and precordium equals a large negative value ($V_R + V_L + V_P$ = a large negative value)

128 *The augmented unipolar limb lead law states that at a given instant the sum of the amplitude of similar waves in leads*

A aV_R aV_L and aV_F equals zero
B I II and III equals zero
C V_1 V_4 and V_6 equals zero

129 *The standard leads may be derived from unipolar leads from amplitudes of similar waves using following formulas*

A V_F minus V_L equals lead I
B V_F minus V_L equals lead II
C V_F minus V_L equals lead III

130 *The augmented unipolar limb leads may be derived from the standard leads using the amplitudes of similar waves with the following formulas*

A aV_R equals $\frac{\text{III minus I}}{2}$

B aV_L equals $\frac{\text{II minus III}}{2}$

C aV_F equals $\frac{\text{II plus III}}{2}$

131 *The unipolar limb leads may be derived from the amplitude of waves of the standard leads using the formula*

A V_R equals $\frac{\text{II minus III}}{3}$

B V_L equals $\frac{\text{I minus III}}{3}$

C V_F equals $\frac{\text{II plus I}}{3}$

132 *A typical anterior transmural myocardial infarct is characterized in the leads overlying the infarct by QS waves and*

A isoelectric S T segements
B positive S T segments
C negative S T segments

133 *A typical subacute transmural anterior myocardial infarct is characterized in the leads overlying the infarct by QS waves and*

A S T segments near the isoelectric line and deeply inverted T waves which change in amplitude with time
B large positive S T segments which become more positive with time
C isoelectric T waves which do not change with time

134 *A typical chronic transmural anterior myocardial infarct is characterized in the leads overlying the infarct by QS waves and*

A essentially isoelectric S T segments and T waves which do not change in amplitude significantly with time
B positive S T segments which change from day to day
C negative S T segments which change from day to day

135 *An old anterior myocardial infarct often does not show diagnostic changes when*

A a left bundle branch block is present
B a right bundle branch block is present
C anterior myocardial ischemia is present

136 *A strictly anterior myocardial infarct often does not produce diagnostic changes in the three standard and unipolar limb leads*

A True
B False

137 *A transmural myocardial infarct involving the anterolateral aspect of the left ventricle is characterized by QS waves in the leads which face the anterolateral wall of the left ventricle*

A True
B False

138 *A typical acute anterolateral myocardial infarct is characterized in lead V_4 by S T segment shifts and QRS complexes whose directions with respect to each other are*

A discordant
B concordant

139 *R waves in lead V_4 are recorded often in the presence of an anterolateral infarct if the infarct involves only*

A a thin layer of the epicardium leaving the endocardium intact
B a thin layer of the endocardium leaving the epicardium intact

140 *An anteroseptal mycardial infarct is one which produces significant changes of the QRS complexes in lead*

A V_1
B V_6
C V_3

141 *A small left ventricular intramural infarct characteristically produces*

A short Q T intervals
B very little change in the QRS complexes
C QS waves in leads which overlie the infarct

142 *A precordial lead directly overlying a transmural anterior infarct characteristically shows*

A QR waves
B QS waves
C RS waves

143 *An infarct involving the lateral wall of the left ventricle*

A often increases the height of the R waves in lead V_1
B produces QS waves in lead V_1
C does not change the standard 12 lead electrocardiogram

144 *A myocardial infarct which involves the lateral wall of the left ventricle usually shows characteristic changes in leads*

A V_5 or aV_L
B II or aV_F
C II or III

145 *An acute large typical posterior myocardial infarct is characterized in lead* aV_F *by*

A relatively deep Q waves and elevated S T segments
B relatively deep Q waves and isoelectric S T segments

146 *A large subacute posterior myocardial infarct is characterized in lead* aV_F *by*

A relatively deep Q waves S T segments which are near the isoelectric line and deeply inverted T waves which change in amplitude in serial tracings
B large R waves without Q waves and isoelectric S T segments
C inverted T waves with isoelectric S T segments

147 *An old posterior myocardial infarct is characterized in lead* aV_F *by*

A T waves which change in amplitude from day to day
B elevated S T segments which change in amplitude from day to day
C relatively deep Q waves with isoeletric S T segments and T waves which do not change in amplitude in serial tracings

148 *A typical large acute posterior myocardial infarct is characterized in lead* aV_F *by J points and S T segments which are*

A concordant with the initial deflection of the QRS complexes
B discordant with the initial deflections of the QRS complexes

149 *The electric potentials at the foot lead* aV_F *which are present during early ventricular depolarization (first 0 04 second) in posterior myocardial infarction are usually relatively*

A negative
B positive

150 *A posterior myocardial infarct may exist in the presence of a normal 12 lead electrocardiogram*

A True
B False

151 *A posterior myocardial infarct high at the base of the left ventricle consistently produces diagnostic changes in the electrocardiogram*

A True
B False

152 *A thin acute subendocardial infarct with the precordial leads overlying the infarct characteristically alters the*

A S T segments
B QRS complexes
C U waves

153 *A large subendocardial infarct may reduce the amplitude of the R waves in leads overlying the infarct if it involves*

A the subendocardium only and does not penetrate deeply into the myocardium
B the subendocardium and most of the thickness of the myocardium

MYOCARDIAL INJURY AND ISCHEMIA

154 *Large transient negative S T segments which appear in lead* V_4 *after exercises are strongly suggestive of*

A subendocardial ischemia and injury
B subepicardial ischemia and injury

155 *Insufficiency of the coronary arteries may exist in the presence of a normal electrocardiogram taken with the patient at rest*

A True
B False

156 *During severe attacks of angina pectoris lead* V_4 *often shows*

A transient negative S T segments
B shortening of Q T intervals

157 *Ischemia involving certain portions of the posterior wall of the left ventricle may produce tall positive T waves in the precordial leads*

A True
B False

158 *Transmural infarction of the anterior wall of the left ventricle produces inverted T waves in the precordial leads which are adjacent to the infarct*

A True
B False

PERICARDITIS

159 *Acute severe diffuse pericarditis is characterized in leads I II and* V_4 *by S T segments which are*

A elevated
B depressed
C isoelectric

160 *The electrocardiographic changes in diffuse acute pericarditis are due to involvement of the*

A pericardium
B subepicardium
C subendocardium

161 *Subacute diffuse pericarditis is characterized by*

A inverted T waves in leads I II and V_4
B tall positive T waves in lead I II and V_4
C widening of the QRS complexes

162 *Chronic pericarditis due to tuberculosis is a cause of low voltage of the QRS complexes*

A True
B False

POSITIONS OF THE HEART

(ELECTROCARDIOGRAPH)

163 *The electrocardiographic position shows an excellent correlation with anatomic position of the heart in health and disease*

A True
B False

164 *The horizontal electrocardiograph position of the heart is associated often with*

A clockwise rotation about the long axis as viewed from the apex
B counterclockwise rotation of the heart about the long axis as viewed from the apex

165 *The horizontal electrocardiographic position is present when the ventricular complexes of lead aVL resemble those of leads* V_5 *and* V_6 *and the ventricular complexes of lead* aV_F *resemble those of leads* V_1 *and* V_2

A True
B False

166 *The semihorizontal electrocardiographic position is present when the ventricular complexes of lead* aV_L *resemble those of leads* V_5 *and* V_6 *and the ventricular complexes of lead* aV_F *are small*

A True
B False

167 *The intermediate electrocardiographic position is present when the ventricular complexes of leads* aV_L *and* aV_F *are similar in form and size and like those of leads* V_5 *and* V_6

A True
B False

168 *The semivertical electrocardiographic position is present when the ventricular complexes of lead* aV_F *resemble those of leads* V_5 *and* V_6 *and the ventricular complexes of lead* aV_L *are small*

A True
B False

169 *The vertical electrocardiographic position is present when the ventricular complexes in lead* aV_L *resemble those of leads* V_1 *and* V_2 *and the ventricular complexes of lead* aV_F *resemble those leads* V_5 *and* V_6

A True
B False

170 *In the normal heart the horizontal electrocardiographic position is associated often with*

A counterclockwise rotation about the axis as viewed from the apex
B clockwise rotation around the long axis as viewed from the apex

171 *The indeterminate electrocardiographic position as described by F N Wilson is said to be present when there is no obvious similarities between the ventricular complexes of the unipolar limb leads and the precordial leads*

A True
B False

PULMONARY INFARCTION

172 *A large acute pulmonary infarct typically produces*

A S waves in lead I Q waves elevated S T segments and inverted T waves in leads III and aV_F
B S waves in lead I and in lead III Q waves elevated S T segments and inverted T waves
C tall R waves in lead I and in lead III Q waves elevated S T segments and inverted T waves

173 *A small subacute pulmonary infarct almost always produces S waves in lead I and in lead III Q waves elevated S T segments and inverted T waves*

A True
B False

THEORY

174 *Theoretically the QRS complexes are isoelectric in lead III and are positive and of equal amplitude in leads I and II when the ventricular depolarization process moves away from the right arm perpendicular to a line connecting the left arm and left leg electrodes*

A True
B False

175 *Lead V_B if connected properly shows the largest QRS complexes when the ventricular depolarization process is perpendicular to*

A the frontal plane of the body
B the saggital plane of the body

176 *Ventricular depolarization results in the writing of the*

A P waves
B atrial T waves
C QRS complexes
D ventricular T waves

177 *Atrial repolarization results in the writing of the*

A P waves
B atrial T waves
C QRS complexes
D U waves

178 *The repolarized state of the ventricles is indicated in the electrocardiogram by the*

A S T intervals
B S T segments
C time interval between the end of the U waves and the beginning of the QRS complexes

179 *The transitional zone of the QRS complexes in the six precordial leads refers to that lead position in which the QRS complexes are*

A of equal amplitude
B predominately positive
C predominately negative

180 *Normally the endocardium of the ventricles is activated early during the ventricular depolarization process*

A True
B False

181 *Theoretically the QRS complexes are isoelectric in lead I and are large and positive and of equal amplitude in leads II and III when the ventricular depolarization process moves toward the foot at an angle with a line connecting the lead I electrodes of*

A 90 degrees
B 30 degrees
C 60 degrees

182 *The QRS complexes are small in lead II and are tall and positive in lead I when the ventricular depolarization process moves toward the left arm perpendicular to a line connecting the right arm and left foot electrodes*

A True
B False

183 *An electromotive force generated perpendicular to the frontal plane of the body results in lead I in*

A tall positive deflections
B deep negative deflections
C the smallest deflections

184 *Inhibition of the ventricular depolarization process sometimes is called defective intraventricular conduction*

A True
B False

185 *The electric potentials of the heart as detected at the surface of the body are*

A inversely proportional to the square of the distance between the heart and the electrode
B inversely proportional to the cube of the distance between the heart and the electrode
C directly proportional to the cube of the distance between the heart and the electrode

186 *A vector quantity is often represented*

A as a point on a graph
B as an arrow with the length of the arrow representing magnitude and position and the arrowhead representing direction

187 *A scalar quantity is often represented*

A as a point on a graph
B as an arrow with the length representing magnitude and the position of the arrow and the arrowhead representing direction

188 *The vector sum of the instantaneous QRS axes is equal to the mean electric QRS axis*

A True
B False

189 *The ventricular gradient is derived from*

A the QRS complexes and T waves
B P waves and auricular P waves
C QRS complexes and P waves

190 *Potassium chloride in adequate concentration when applied locally to a portion of a cell membrane produces a current of injury*

A True
B False

191 *The direction of the mean electric axis of the QRS complexes normally is from the*

A apex of the heart to the valvular orifices (base of the heart)
B valvular orifices to the apex of the heart

192 *The vectorcardiogram represents as a series of vectors many of the instantaneous electric forces which are associated with cardiac activity*

A True
B False

193 *A homogenous volume conductor is a medium which permits the conduction of a current equally in all directions*

A True
B False

194 *The quartz fiber of a string galvanometer moves because the current from the patient flowing over the fiber produces an electromagnetic field which interacts with a magnetic field produced by a fixed magnet*

A True
B False

195 *One of Kirchoff s laws states that the algebraic sum of all electric forces flowing to a single point in a network is zero*

A True
B False

196 *The smallest squares on the background graph of the standard electrocardiogram measure*

A 100 microvolts tall and 0 02 second in duration
B 10 microvolts tall and 0 2 second in duration
C 100 microvolts tall and 0 04 second in duration

197 *The string galvanometer for electrocardiography was described first by*

A Waller in 1887
B Einthoven in 1903
C Wilson in 1906

198 *The size and direction of the ventricular deflections in any lead depend upon*

A the proximity of the lead to the ventricular myocardium only
B the proximity of the lead to the ventricular myocardium the thickness of ventricular myocardium and the direction in which the electromotive forces are directed with respect to the position of the electrodes

WAVES, INTERVALS, SEGMENTS AND J POINT

199 *Broad and notched P waves in leads I and II*

A suggests cor pulmonale
B are diagnostic of atrial infarction
C are seen often in mitral stenosis

200 *Notching of the P waves without abnormalities of height or duration is*

A diagnostic of cardiac disease
B not diagnostic of cardiac disease

201 *P waves typical of chronic cor pulmonale are*

A wide and notched leads I II and aV_L
B wide and notched in leads II III and aV_F
C tall and peaked in leads II III and aV_F

202 *The upper limit of normal for duration of P waves in adults is*

A 0 06 second
B 0 08 second
C 0 11 second

203 *Wide notched P waves in leads I and II are suggestive of enlargement of the*

A left atrium
B right atrium

204 *The amplitude of the P waves in lead II for most adults normally does not exceed*

A 100 microvolts
B 150 microvolts
C 250 microvolts

205 *Prolonged P R intervals are*

A diagnostic of rheumatic heart disease
B not in themselves diagnostic of rheumatic heart disease

206 *Prolonged P R intervals during a febrile illness are*

A pathognomonic of rheumatic fever
B not pathognomonic of rheumatic fever

207 *The P R interval measures the time required for*

A sino atrial conduction only
B conduction through the atria and through the atrioventricular node
C conduction through the Purkinje system

208 *In measuring the P R interval it is advisable to make the measurement in a lead in which the P waves are wide and there are prominent Q waves or wide QRS complexes*

A True
B False

209 *Q waves in lead aV_F which measure 0 04 second from the beginning of the wave to the nadir indicate often a posterior myocardial infarct*

A True
B False

210 *Q waves in lead* aV_F *which are more than 28 percent of the height of the R waves when the amplitude of the QRS complexes is greater than 5 0 mm indicate usually a posterior myocardial infarct*

A True
B False

211 *Relatively deep Q waves (up to 0 6 millivolt) in lead III*

A are diagnostic of a posterior myocardial infarct
B are often normal
C rule out a posterior infarct

212 *Septal Q waves often are seen in lead I and generally are less than 0 03 second in duration and less than 3 0 mm deep*

A True
B False

213 *QS waves in lead* aV_R

A indicate infarction of the right ventricle
B reflect potential variations of the normally activated endocardium of the heart
C are diagnostic of right ventricular enlargement

214 *Normally the ventricular depolarization process occurs first from the left to the right side of the septum (Q waves) next from the endocardium to the apex and lateral portion of the left ventricle (R waves) and lastly toward the posterior portion of the heart (S waves)*

A True
B False

215 *The QRS complexes of some of the precordial V leads are wider than those of the unipolar limb leads*

A True
B False

216 *Wide M shaped QRS complexes which are preceded by P waves in leads* V_1 *and* V_2 *suggest*

A a right bundle branch block
B a left bundle branch block
C myocardial infarction

217 *Wide M shaped QRS complexes which are preceded by P waves in leads* V_5 *and* V_6 *suggest*

A a right bundle branch block
B a left bundle branch block
C myocardial infarction

218 *Splintering of the QRS complexes is common normally in*

A lead III
B lead II
C lead I

219 *The width of the QRS complexes in the tracings of most normal adult individuals does not exceed 0 10 second in the standard and unipolar limb leads*

A True
B False

220 *Low voltage of the QRS complexes in the standard and unipolar limb leads is good evidence of myocardial disease*

A True
B False

221 *Wide QRS complexes exceeding 0 12 second*

A are common with a complete left bundle branch block
B do not occur with hyperkalemia
C do not occur with quinidine intoxication

222 *The Q T intervals*

A do not vary with the heart rate
B show a linear relation to the heart rate
C vary approximately with the square root of the heart rate

223 *Short Q T intervals occur in*

A hypothyroidism
B hyperparathyroidism
C hypoparathyroidism

224 *After large doses of digitalis the Q T intervals are characteristically*

A prolonged
B shortened
C unchanged

225 *Normally the Q T intervals are longer for women than for men and children*

A True
B False

226 *Long Q T intervals in the presence of a normal blood calcium are diagnostic of organic myocardial disease*

A True
B False

227 *Q T_C represents the Q T intervals corrected for*

A temperature
B heart rate
C area of the body
D amplitude of QRS complexes

228 *In lead V_3 positive S T segments which measure 0 2 millivolt above the isoelectric line are*

A diagnostic of anterior myocardial injury
B diagnostic of pericarditis
C sometimes encountered normally

229 *Abnormally large positive S T segment shifts in lead aV_F which persist for 24 hours or longer usually indicate*

A a posterior myocardial infarct
B an anterior myocardial infarct

230 *Abnormal S T segment shifts and abnormally inverted T waves in lead V_4 may occur in patients with rheumatic myocarditis*

A True
B False

231 *With normal QRS complexes and T waves an elevation of the R T junctions in leads V_2 and V_3 of 0 2 mv*

A are diagnostic of an anteroseptal infarct
B suggest acute diffuse subendocardial injury
C are diagnostic of pericarditis
D may be normal

232 *The J point is the point of junction between*

A the QRS complexes and the S T segments
B the P R segment and the QRS complexes

233 *Inversion of T waves in leads V_5 and V_6 in the presence of a complete left bundle branch block*

A is diagnostic of ischemia of the left ventricle in addition to a defect in the left bundle of His
B may be secondary effect associated with large QRS complexes

234 *Coved and inverted T waves with normal QRS complexes in lead V_4 are diagnostic of myocardial ischemia*

A True
B False

235 *Negative T waves in lead I in the presence of clearly positive QRS complexes in this lead are often evidence of cardiac disease*

A True
B False

236 *Primary T wave changes are always associated with increased areas under the QRS complexes*

A True
B False

237 *T waves in lead III which are more negative than minus 4 0 mm (with normal standardization) generally are*

A abnormal
B normal

PART C

APPENDIX

DETERMINING HEART RATE

(Beats per minute)

mm* Rate	mm* Rate	mm* Rate	mm* Rate	mm* Rate	mm* Rate
1 — 1500	14 — 107	26 — 58	39 — 39	51 — 30	64 — 23
2 — 750	15 — 100	27 — 56	40 — 38	52 — 29	65 — 23
3 — 500	16 — 94	28 — 54	41 — 37	53 — 28	66 — 23
4 — 375	17 — 88	29 — 52	42 — 36	54 — 28	67 — 22
5 — 300	18 — 83	30 — 50	43 — 35	55 — 27	68 — 22
6 — 250	19 — 79	31 — 48	44 — 34	56 — 27	69 — 22
7 — 214	20 — 75	32 — 47	45 — 33	57 — 26	70 — 21
8 — 187	21 — 71	33 — 45	46 — 33	58 — 26	71 — 21
9 — 167	22 — 68	34 — 44	47 — 32	59 — 25	72 — 21
10 — 150	23 — 65	35 — 43	48 — 31	60 — 25	73 — 20
11 — 136	24 — 63	36 — 42	49 — 31	61 — 25	74 — 20
12 — 125	25 — 60	37 — 41	50 — 30	62 — 24	75 — 20
13 — 115		38 — 40		63 — 24	

**Number of millimeters (0.04 sec per mm) between recurring complexes*

REFERENCES

1 Winsor T Unpublished data

AGE AND HEART

AGE	HEART RATE (Beats per minute)			AGE	HEART RATE (Beats per minute)		
	Cases	Mean	Range		Cases	Mean	Range
0 — 24 hrs	14	125	88 to 166	8 — 10 yrs	16	81	62 to 142
0 — 2 yrs	16	127	107 156	11 — 14	15	81	55 126
2 — 4	16	99	72 125	Adults	1000	64	38 100*
5 — 7	37	88	71 109				

**Three adults in this series had heart rates greater than 100 the highest being 110*

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1 Graybiel A et al Analysis of the electrocardiograms obtained from 1000 young healthy aviators Am Heart J 27 524 549 (April) 1944

2 Yu P N G Joos H A and Katsampes C P Unipolar electrocardiogram in normal infants and children Am Heart J 41 91 104 (Jan) 1951

3 Ziegler R F Electrocardiographic Studies in Normal Infants and Children Springfield Ill Charles C Thomas 1951

P WAVES

AMPLITUDE (mm)

LIMB LEADS						PRECORDIAL LEADS					
Lead	Age	# Cases	Mean	Range		Lead	Age	# Cases	Mean	Range	
I	24 hrs	32	0 8	0 0 to	1 5	V_1	24 hrs	41	0 1	0 0 to	2 0
	1—3 yrs	57	1 2	0 5	2 5		1—3 yrs	36	0 8	−1 0	2 0
	3—5	53	1 1	0 5	2 0		3—5	28	1 0	0 0	2 5
	5—8	90	1 1	0 5	2 0		5—8	44	0 9	0 0	2 5
	12—16	68	0 9	0 0	2 0		12—16	45	0 4	0 0	1 5
	Adults	500	0 7	0 1	1 3		Adults	121	0 6	−0 8	1 6
II	24 hrs	32	1 5	0 0	2 5	V_2	24 hrs	41	1 1	0 0	2 0
	1—3 yrs	57	1 7	0 0	3 0		1—3 yrs	36	1 4	0 0	2 0
	3—5	53	1 7	0 5	3 0		3—5	28	1 2	0 0	1 5
	5—8	90	1 7	0 5	3 0		5—8	44	1 3	0 0	2 0
	12—16	68	1 6	1 0	3 0		12—16	45	1 1	0 0	2 0
	Adults	500	1 4	0 3	2 5		Adults	121	0 8	0 2	1 6
III	24 hrs	32	0 6	−1 0	2 0	V_3	24 hrs	41	1 7	1 0	3 0
	1—3 yrs	57	0 7	−1 5	1 5		1—3 yrs	36	1 2	0 0	2 0
	3—5	53	0 6	−1 0	2 0		3—5	28	1 1	1 0	1 5
	5—8	90	0 7	−1 0	2 0		5—8	44	1 1	0 5	1 5
	12—16	68	0 7	−0 5	2 0		12—16	45	1 0	0 5	1 5
	Adults	500	0 7	−0 5	1 9		Adults	121	0 6	0 0	1 8
aV_R	24 hrs	32	−0 9	−2 0	1 5	V_4	24 hrs	41	1 1	0 5	2 0
	0—2 yrs	16	−0 8	−1 5	−1 0		1—3 yrs	36	1 1	0 5	1 5
	3—5	16	−0 9	−1 2	−0 5		2—4	28	1 0	0 5	1 5
	6—10	53	−0 8	−1 5	−0 2		5—10	44	0 1	0 0	1 5
	12—16	15	−0 8	−1 5	−0 3		11—14	45	1 0	0 3	1 5
	Adults	15	−0 8	−0 1	−1 0		Adults	121	0 6	0 1	2 3
aV_L	24 hrs	32	0 1	−1 5	1 5	V_5	24 hrs	41	1 3	1 0	2 0
	0—2 yrs	16	0 1	−0 1	0 8		1—3 yrs	36	0 1	0 5	1 5
	3—5	16	0 2	−0 5	1 0		2—4	28	0 9	0 5	1 0
	6—10	53	0 3	−0 5	2 0		5—10	44	0 8	0 0	1 5
	12—16	15	0 2	−0 1	0 6		11—14	45	0 9	0 3	1 0
	Adults	15	0 1	−0 5	0 8		Adults	121	0 6	0 0	2 4
aV_F	24 hrs	32	1 1	−1 0	2 0	V_6	24 hrs	41	0 9	0 0	2 0
	0—2 yrs	16	0 8	0 2	1 5		1—3 yrs	36	0 8	0 5	1 5
	3—5	16	0 6	0 0	1 5		2—4	28	0 8	0 5	1 0
	6—10	53	0 6	0 2	2 0		5—10	44	0 8	0 0	1 5
	12—16	15	0 5	0 0	1 5		11—14	45	0 7	0 3	1 0
	Adults	15	0 8	−0 3	1 5		Adults	121	0 6	0 0	1 4

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5 Ziegler R F Electrocardiographic Studies in Normal Infants and Children Springfield Ill Charles C Thomas 1951

6 Sokolow M and Lyon T P Ventricular complex in left ventricular hypertrophy as obtained by unipolar precordial and limb leads Am. Heart J 37 161 186 (Feb) 1949

7 Winsor T Unpublished data

P WAVES

DURATION* (Seconds)

AGE	NO CASES	MEAN	RANGE
0 — 24 hrs	14	0 05	0 04 to 0 06
1 — 3 yrs	57	0 06	0 05 0 09
3 — 5	53	0 07	0 04 0 10
5 — 8	90	0 07	0 05 0 10
8 — 12	88	0 08	0 05 0 10
12 — 16	68	0 08	0 06 0 10
Adults	100	0 08	0 06 0 11

* *Widest P waves of the 6 limb and 6 precordial leads usually V V or V*

REFERENCES

1 Ziegler R F Electrocardiographic Studies in Normal Infants and Children Springfield Ill Charles C Thomas 1951

2 Ashman R and Hull E Essentials of Electrocardiography 2nd ed N Y Macmillan Company 1941

Q WAVES

AMPLITUDE (mm)

LIMB LEADS						PRECORDIAL LEADS					
Lead	Age	# Cases	Mean	Range		Lead	Age	# Cases	Mean	Range	
I	24 hrs	32	0 5	0 0 to	0 5	V_1	24 hrs	41	0 0	0 0 to	0 0
	0—2 yrs	72	0 7	0 0	2 0		0—2 yrs	72	0 0	0 0	0 0
	3—5	72	0 1	0 0	1 0		3—5	72	0 0	0 0	0 0
	6—10	72	0 2	0 0	2 0		6—10	72	0 0	0 0	0 0
	12—16	68	0 1	0 0	3 0		12—16	49	0 0	0 0	0 0
	Adults	500	0 9	0 0	4 0		Adults	121	0 0	0 0	0 0
II	24 hrs	32	1 5	0 0	5 0	V_2	24 hrs	41	0 0	0 0	0 0
	0—2 yrs	72	1 3	0 0	3 0		0—2 yrs	72	0 0	0 0	0 0
	3—5	72	0 3	0 0	2 0		3—5	72	0 0	0 0	0 0
	6—10	72	0 5	0 0	3 0		6—10	72	0 0	0 0	0 0
	12—16	68	1 2	0 0	2 5		12—16	49	0 0	0 0	0 0
	Adults	500	1 1	0 0	4 0		Adults	121	0 0	0 0	0 0
III	24 hrs	32	2 5	0 5	9 0	V_3	24 hrs	41	0 0	0 0	0 0
	0—2 yrs	72	1 6	0 0	4 0		0—2 yrs	72	0 0	0 0	0 0
	3—5	72	1 4	0 0	3 0		3—5	72	0 0	0 0	0 0
	6—10	72	0 6	0 0	3 0		6—10	72	0 4	0 0	1 0
	12—16	68	1 6	0 0	5 0		12—16	49	0 0	0 0	0 7
	Adults	500	1 4	0 0	6 0		Adults	121	0 0	0 0	0 5
aV_R	24 hrs	32	2 4	0 0	4 0	V_4	24 hrs	41	1 3	0 0	1 5
	0—2 yrs	16	1 6	0 0	10 5		0—2 yrs	72	0 1	0 0	1 0
	2—4	16	2 9	0 0	10 0		3—5	72	0 3	0 0	2 5
	5—10	53	1 4	0 0	10 0		6—10	72	0 2	0 0	1 5
	11—14	15	1 0	0 0	8 0		10—15	49	0 1	0 0	2 4
	Adults	151	2 0	0 0	8 0		Adults	121	0 1	0 8	1 6
aV_L	24 hrs	32	1 3	0 0	2 0	V_5	24 hrs	41	2 2	0 0	5 5
	0—2 yrs	16	0 1	0 0	0 5		0—2 yrs	72	0 8	0 0	6 0
	2—4	16	0 2	0 0	1 0		3—5	72	0 8	0 0	3 0
	5—10	53	0 1	0 0	1 0		6—10	72	0 6	0 0	4 0
	11—14	15	0 1	0 0	0 5		10—15	49	0 3	0 0	2 1
	Adults	151	0 2	0 0	3 5		Adults	121	0 5	0 0	2 1
aV_F	24 hrs	32	1 8	0 0	6 0	V_6	24 hrs	41	1 3	0 0	2 0
	0—2 yrs	16	1 2	0 0	4 0		0—2 yrs	72	1 1	0 0	3 0
	2—4	16	1 3	0 0	4 0		3—5	72	0 7	0 0	2 5
	5—10	53	0 5	0 0	3 0		6—10	72	0 4	0 0	3 0
	11—14	15	0 4	0 0	2 0		10—15	49	0 5	0 0	1 7
	Adults	151	0 5	0 0	3 0		Adults	121	0 4	0 0	2 7

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2 Stewart C B and Manning G W A detailed analysis of the electrocardiograms of 500 R C A F air crew Am Heart J 27 502 523 (April) 1944

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6 Winsor T Unpublished data

7 Battro A and Mendy J C Precordial leads in children Arch Int Med 78 31-41 (July) 1946

R WAVES

AMPLITUDE (mm.)

LIMB LEADS					PRECORDIAL LEADS				
Lead	Age	# Cases	Mean	Range	Lead	Age	# Cases	Mean	Range
I	24 hrs	32	2 6	0 0 to 5 5	V_1	24 hrs	41	16 7	3 0 to 23 0
	0—2 yrs	72	4 2	0 0 10 0		0—2 yrs	16	7 0	1 0 14 5
	3—5	72	5 0	2 0 10 0		2—4	16	7 5	2 0 14 0
	6—10	72	5 0	2 0 9 0		8—10	16	3 6	1 0 9 0
	10—15	49	4 8	1 3 11 4		11—14	15	5 1	0 5 15 5
	Adults	121	5 3	0 7 11 3		Adults	151	2 3	0 0 7 0
II	24 hrs	32	5 5	1 0 21 0	V_2	24 hrs	41	21 0	3 0 41 0
	0—2 yrs	72	5 7	0 0 14 0		0—2 yrs	16	13 0	4 5 22 0
	3—5	72	7 6	3 0 12 0		2—4	16	12 7	5 0 25 0
	6—10	72	7 2	3 0 13 0		8—10	16	7 8	2 0 14 5
	10—15	49	9 1	3 7 16 0		11—14	15	8 3	1 5 23 5
	Adults	121	7 1	1 8 16 8		Adults	151	5 9	0 0 16 0
III	24 hrs	32	8 8	2 0 21 0	V_3	24 hrs	41	20 0	14 0 28 0
	0—2 yrs	72	5 6	1 0 11 0		0—2 yrs	16	14 0	3 0 24 0
	3—5	72	5 6	2 0 10 0		2—4	16	13 4	6 0 25 0
	6—10	72	4 2	0 5 13 0		8—10	16	8 4	5 0 12 5
	10—15	49	6 0	0 7 15 8		11—14	15	9 2	3 0 22 0
	Adults	121	3 8	0 3 13 1		Adults	151	8 9	1 5 26 0
aV_R	24 hrs	32	3 7	0 0 9 0	V_4	24 hrs	41	19 0	3 0 32 0
	0—2 yrs	16	1 0	0 5 4 0		0—2 yrs	16	20 0	3 5 35 0
	2—4	16	1 3	0 0 3 0		2—4	16	18 5	9 0 30 0
	8—10	16	1 2	0 5 6 0		8—10	16	14 9	4 0 30 0
	11—14	15	1 2	0 5 8 0		11—14	15	17 2	7 0 28 0
	Adults	151	0 8	0 0 5 0		Adults	151	14 2	4 0 27 0
aV_L	24 hrs	32	2 1	1 0 6 0	V_5	24 hrs	41	12 0	4 5 21 0
	0—2 yrs	16	4 0	0 5 8 0		0—2 yrs	16	16 0	2 5 25 0
	2—4	16	3 1	0 5 7 0		2—4	16	18 4	10 0 26 0
	8—10	16	1 2	0 5 8 8		8—10	16	17 4	6 0 28 0
	11—14	15	1 6	0 5 6 0		11—14	15	16 4	6 0 29 0
	Adults	151	2 1	0 0 10 0		Adults	151	12 1	4 0 26 0
aV_F	24 hrs	32	6 6	2 0 20 0	V_6	24 hrs	41	4 5	0 0 11 0
	0—2 yrs	16	8 8	0 5 16 0		0—2 yrs	16	12 0	2 0 20 0
	2—4	16	9 5	0 5 19 5		2—4	16	14 6	8 0 23 0
	8—10	16	8 5	3 5 14 0		8—10	16	12 5	5 0 19 1
	11—14	15	10 5	5 0 21 0		11—14	15	13 5	4 0 25 0
	Adults	151	1 3	0 0 20 0		Adults	151	9 2	4 0 22 0

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S WAVES

AMPLITUDE (mm)

LIMB LEADS					PRECORDIAL LEADS				
Lead	Age	# Cases	Mean	Range	Lead	Age	# Cases	Mean	Range
I	24 hrs	32	6 3	0 0 to 15 0	V_1	24 hrs	41	10 0	0 0 to 28 0
	0—2 yrs	72	3 9	0 0 7 0		0—2 yrs	16	4 8	0 5 14 0
	2—5	72	2.5	0 0 6 0		2—4	16	8 6	3 0 16 0
	6—10	72	1 6	0 0 3 0		8—10	16	8 6	3 0 16 0
	10—15	49	1 8	0 0 6 8		11—14	15	11 6	0 0 20 0
	Adults	121	1 0	0 0 3 6		Adults	151	8 6	2 0 25 0
II	24 hrs	32	3 2	0 0 7 0	V_2	24 hrs	41	22 0	1 0 42 0
	0—2 yrs	72	2 7	0 0 5 0		0—2 yrs	16	9 3	0 5 21 0
	2—5	72	1 6	0 0 4 0		2—4	16	16 0	8 5 30 0
	6—10	72	1 4	0 0 3 5		8—10	16	16 8	8 0 30 0
	10—15	49	1 6	0 0 4 9		11—14	15	20 8	7 0 36 0
	Adults	121	1 2	0 0 4 9		Adults	151	12 7	0 0 29 0
III	24 hrs	32	2 3	0 0 3 0	V_3	24 hrs	41	26 4	0 0 39 0
	0—2 yrs	72	1 1	0 0 3 5		0—2 yrs	16	10 2	0 5 23 0
	2—5	72	0 8	0 0 5 0		2—4	16	12 7	3 5 21 0
	6—10	72	0 7	0 0 4 0		8—10	16	16 3	8 0 27 0
	10—15	49	0 9	0 0 5 3		11—14	15	14 8	1 0 30 0
	Adults	121	1 2	0 0 5 5		Adults	151	8 8	0 0 25 0
aV_R	24 hrs	32	3 9	0 0 9 5	V_4	24 hrs	41	23 0	0 0 42 0
	0—2 yrs	16	6 3	0 0 14 0		0—2 yrs	16	10 2	2 0 22 0
	2—4	16	5 9	0 0 14 0		2—4	16	9 0	0 0 20 0
	8—10	16	4 9	0 0 10 0		8—10	16	11 2	4 0 17 0
	11—14	15	8 3	0 0 17 0		11—14	15	8 0	1 0 16 0
	Adults	151	4 3	0 0 13 0		Adults	151	5 2	0 0 20 0
aV_L	24 hrs	32	6 6	0 0 16 0	V_5	24 hrs	41	12 0	1 5 30 0
	0—2 yrs	16	3 4	0 0 7 0		0—2 yrs	16	6 1	1 0 13 0
	2—4	16	2 7	0 0 6 0		2—4	16	4 4	0 0 11 0
	8—10	16	3 2	0 0 7 0		8—10	16	5 7	0 5 12 0
	11—14	15	3 1	0 0 9 0		11—14	15	3 7	0 5 8 0
	Adults	151	0 4	0 0 18 0		Adults	151	1 5	0 0 6 0
aV_F	24 hrs	32	3 0	0 0 7 5	V_6	24 hrs	41	4 5	0 0 13 0
	0—2 yrs	16	0 7	0 0 2 5		0—2 yrs	16	2 5	0 0 7 5
	2—4	16	2 1	0 0 14 0		2—4	16	1 6	0 5 5 0
	8—10	16	0 7	0 0 2 0		8—10	16	1 1	0 0 4 0
	11—14	15	0 8	0 0 2 5		11—14	15	0 9	0 0 2 0
	Adults	151	0 2	0 0 8 0		Adults	151	0 6	0 0 7 0

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T WAVES

AMPLITUDE (mm)

LIMB LEADS					PRECORDIAL LEADS				
Lead	Age	# Cases	Mean	Range	Lead	Age	# Cases	Mean	Range
I	24 hrs	41	0 3	−2 0 to 3 0	V_1	24 hrs	32	1 3	−4 0 to 6 0
	0—2 yrs	72	2 6	0 5 5 0		0—2 yrs	16	−2 3	−4 5 −0 5
	3—5	72	1 7	0 0 4 0		2—4	16	−2 2	−5 5 −1 0
	6—10	72	2 0	0 5 4 0		8—10	16	−1 7	−3 0 1 5
	10—15	49	2 6	1 1 5 0		11—14	15	−1 3	−3 5 0 2
	Adults	500	3 0	1 0 5 0		Adults	151	0 2	−4 0 4 0
II	24 hrs	41	1 2	0 0 3 0	V_2	24 hrs	32	1 3	−7 5 9 0
	0—2 yrs	72	2 4	1 0 4 0		0—2 yrs	16	−2 4	−6 0 0 4
	3—5	72	1 8	0 5 4 0		2—4	16	−2 6	−7 0 3 0
	6—10	72	2 1	0 5 5 0		8—10	16	0 0	−3 5 5 0
	10—15	49	3 0	0 9 6 5		11—14	15	0 7	−1 5 3 5
	Adults	500	3 8	1 0 6 6		Adults	151	5 5	−3 0 18 0
III	24 hrs	41	1 0	−1 0 3 0	V_3	24 hrs	32	−0 4	−7 0 4 0
	0—2 yrs	72	0 2	0 0 3 0		0—2 yrs	16	−0 7	−5 0 4 5
	3—5	72	0 2	0 0 1 5		2—4	16	−0 7	−5 0 5 0
	6—10	72	0 1	0 0 1 0		8—10	16	1 8	−2 0 4 5
	10—15	49	0 4	−1 9 3 1		11—14	15	1 7	0 0 5 0
	Adults	500	0 8	−1 4 3 4		Adults	151	5 4	−2 0 16 0
aV_R	24 hrs	41	−0 4	−3 0 2 0	V_4	24 hrs	32	−0 6	−7 0 3 0
	0—2 yrs	16	−2 0	−3 0 −0 5		0—2 yrs	16	1 7	−2 5 5 0
	2—4	16	−2 5	−5 0 −1 5		2—4	16	2 4	0 0 11 0
	8—10	16	−2 0	−3 5 −0 2		8—10	16	3 2	0 0 9 0
	11—14	15	−2 2	−4 0 −1 5		11—14	15	3 3	0 0 7 0
	Adults	151	−2 3	−5 0 1 5		Adults	151	4 8	0 0 17 0
aV_L	24 hrs	41	0 1	−1 5 2 0	V_5	24 hrs	32	1 3	−4 0 5 0
	0—2 yrs	16	0 7	−0 5 2 0		0—2 yrs	16	2 6	1 2 5 5
	2—4	16	1 4	−0 5 3 0		2—4	16	3 4	0 0 7 0
	8—10	16	0 7	−1 0 2 5		8—10	16	4 1	0 5 11 0
	11—14	15	0 8	0 5 2 0		11—14	15	3 1	1 0 5 0
	Adults	151	0 5	−4 0 6 0		Adults	151	3 4	0 0 9 0
aV_F	24 hrs	41	0 9	−1 0 3 0	V_6	24 hrs	32	1 2	−3 0 6 0
	0—2 yrs	16	1 6	0 8 3 5		0—2 yrs	16	2 2	0 5 4 0
	2—4	16	1 8	−0 2 4 0		2—4	16	3 2	1 5 5 0
	8—10	16	1 4	−0 2 3 0		8—10	16	3 1	0 0 8 0
	11—14	15	1 3	0 0 3 5		11—14	15	2 3	1 0 4 0
	Adults	151	1 7	−0 5 5 0		Adults	151	2 4	−0 5 5 0

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3 Stewart C B and Manning G W A detailed analysis of the electrocardiograms of 500 R.C.A.F air crew Am Heart J 27 502 523 (April) 1944
4 Yu P N G Joos H A and Katsampes C P Unipolar electrocardiogram in normal infants and children Am Heart J 41 91 104 (Jan) 1951
5 Ziegler R F Electrocardiographic Studies in Normal Infants and Children Springfield Ill Charles C Thomas 1951
6 Sokolow M and Lyon T P Ventricular complex in left ventricular hypertrophy as obtained by unipolar precordial and limb leads Am Heart J 37 161 186 (Feb) 1949

QRS COMPLEXES

DURATION* (Seconds)

Age	# Cases	Mean	Range
24 hrs	14	0 06	0 04 to 0 10
0 — 2 yrs	16	0 06	0 05 0 08
2 — 4	16	0 07	0 05 0 08
5 — 7	35	0 07	0 06 0 08
8 —10	16	0 07	0 05 0 08
11 — 14	14	0 07	0 06 0 08
Adults	100	0 08	0 06 0 10

**Widest QRS complex of the 6 limb and 6 precordial leads usually V V or V*

REFERENCES

1 Yu P N G Joos H A and Katsampes C P Unipolar electrocardiogram in normal infants and children Am Heart J 41 91 104 (Jan) 1951

2 Ziegler R F Electrocardiographic Studies in Normal Infants and Children Spring field Ill Charles C Thomas 1951

3 Ashman R and Hull E Essentials of Electrocardiography 2nd ed N Y Mac millan Company 1941

RATIOS OF WAVES* (Amplitudes)

Adults

LEAD	Q/R		R/S		R/T	
	Mean	Range	Mean	Range	Mean	Range
aV_R	4 97	0 0 to 14 0	0 0	0 0 to 0 1	0 0	0 0 to 0 0
aV_L	0 24	0 0 0 75	1 5	0 0 8 0	2 6	0 1 10 0
aV_F	0 10	0 0 0 28	2 4	0 0 16 0	4 6	0 3 14 0
V_1			0 3	0 0 1 0	1 4	0 3 7 0
V_2			0 2	0 1 13 0	1 4	0 2 12 0
V_3			1 4	0 1 10 1	1 9	0 3 13 0
V_4	0 04	0 0 0 10	4 1	0 2 19 0	3 1	0 3 9 0
V_5	0 07	0 0 0 16	7 3	1 0 24 0	3 5	1 0 9 0
V_6	0 09	0 0 0 21	9 0	2 3 22 0	4 1	1 7 10 0

16 to 151 cases

REFERENCES

1 Sokolow M and Lyon T P Ventricular complex in left ventricular hypertrophy as obtained by unipolar precordial and limb leads Am Heart J 37 161 186 (Feb) 1949

INTRINSICOID DEFLECTIONS FOR VARIOUS AGES (V_1 and V_6)*

		V_1		V_6	
Age	# Cases	Mean	Range	Mean	Range
1 — 7 weeks		0 012	0 005 to 0 025	0 020	0 010 to 0 028
2— 12 months		0 013	0 005 0 026	0 024	0 018 0 036
1 — 2 years		0 016	0 004 0 026	0 028	0 018 0 036
2 — 6		0 017	0 004 0 026	0 030	0 020 0 040
6 — 13		0 018	0 004 0 026	0 030	0 020 0 040
Adults	100	0 017	0 000 0 030	0 039	0 016 0 052

REFERENCES

1 Myers G B et al Normal variations in multiple precordial leads Am Heart J 34 785 808 (Dec) 1947

2 Nicolson G Clinical Electrocardiography in Children N Y Macmillan Company 1953

3 Winsor T Unpublished data

INTRINSICOID DEFLECTIONS

(Leads V_1 through V_6)*

# Cases	Sex	Age	Lead	Mean	Min	Max	Stand Dev
100	M	10 to 20	V_1	0 020	0 000	0 031	0 0043
			V_2	0 022	0 012	0 030	0 0039
			V_3	0 026	0 014	0 044	0 0050
			V_4	0 029	0 015	0 052	0 0061
			V_5	0 037	0 022	0 053	0 0066
			V_6	0 037	0 024	0 050	0 0063

Measured from beginning of QRS complex to peak of R waves in seconds

REFERENCES

1 Sodi Pallares D et al La deflexion intrinseca en casos normales y en hipertrofias ventriculares Arch Inst Cardiol Mexico 16 397-4 0 (Oct 31) 1946

P R INTERVAL FOR VARIOUS AGES AND HEART RATES*

UPPER LIMIT OF NORMAL (Seconds)

	HEART RATE (Beats per Minute)				
Age Years	Below 70	71 90	91 110	111 130	Over 130
0 — 1 5	0 16	0 15	0 15	0 14	0 13
1 5 — 6	0 17	0 17	0 16	0 15	0 14
7 — 13	0 18	0 17	0 16	0 15	0 14
14 — 17	0 19	0 18	0 17	0 16	0 15
Small adults	0 20	0 19	0 18	0 17	0 16
Large adults	0 21	0 20	0 19	0 18	0 17

**P R interval (seconds) measured in the standard lead with the tallest P*

REFERENCES

1 Ashman R and Hull E Essentials of Electrocardiography 2nd ed N Y Macmillan Company 1941

S T SEGMENTS (Elevation or Depression in mm)

	Newborn to 1 year 185 cases		1 to 10 yrs 227 cases		Adults*† 100 cases		
Lead	Min	Max	Min	Max	Mean	Min	Max
I	–0 1	0 1	–1 0	1 0	0 11	–0 3	0 9
II	–0 1	0 2	–1 0	2 0	0 21	–1 0	1 0
III	–0 2	0 2	–1 0	1 0	0 04	–0 6	0 8
aV_R	–0 1	0 1	–1 0	1 0	0 55	–0 6	0 6
aV_L	–0 1	0 1	–1 0	1 0	0 28	–0 5	0 3
aV_F	–0 05	0 2	–1 0	1 0	–0 32	–0 6	1 0
V_1	–0 2	0 1	–1 0	2 0	0 21	–0 1	0 8
V_2	–0 2	0 2	–1 0	2 5	0 47	0 0	1 5
V_3	–0 2	0 25	0 0	2 5	0 58	0 0	2 0
V_4	–0 1	0 2	0 0	2 0	0 33	–0 1	2 0
V_5	—	0 2	–1 0	1 2	0 14	–0 5	0 6
V_6	—	0 1	–1 0	1 0	0 04	–0 5	0 5

**Measurements were made from the base line in front of the P waves*

†Unipolar limb and chest lead measurements (93 cases) include all electrocardiographic positions except vertical

REFERENCES
1 Kossmann, C E The normal electrocardiogram Circulation 8 920 936 (Dec) 1953
2 Winsor T Unpublished data

S T SEGMENTS IN VERTICAL ELECTROCARDIOGRAPHIC POSITION*

(Elevation or Depression in mm) 7 cases

Lead	Mean	Min	Max
I	0 07	–0 3	0 2
II	0 16	–0 5	0 7
III	0 17	–0 4	0 9
aV_R	0 28	–0 3	0 2
aV_L	–0 29	–0 4	0 2
aV_F	0 0	–0 5	1 0
V_1	0 11	0 0	0 5
V_2	0 51	0 1	0 8
V_3	0 66	0 1	2 0
V_4	0 43	0 1	1 4
V_5	0 16	0 0	0 7
V_6	0 17	0 0	0 8

**Measurements made from the base line in front of the P waves*

REFERENCES
1 Winsor T Unpublished data.

Q T INTERVAL

NORMAL RANGE FOR VARIOUS HEART RATES AND CYCLE LENGTHS

Heart Rate (Min.)	Cycle Length (R R Interval) (Sec.)	Lepeschkin	Ashman			
		Lower Limit of Normal (Sec.)	Mean (Seconds)		Upper Limit of Normal (Sec.)	
			Men & Child	Women	Men & Child	Women
40	1.50	0.42	0.45	0.46	0.49	0.50
43	1.40	0.39	0.44	0.45	0.48	0.49
46	1.30	0.38	0.43	0.44	0.47	0.48
48	1.25	0.37	0.42	0.43	0.46	0.47
50	1.20	0.36	0.41	0.43	0.45	0.46
52	1.15	0.35	0.41	0.42	0.45	0.46
55	1.10	0.34	0.40	0.41	0.44	0.45
57	1.05	0.34	0.39	0.40	0.43	0.44
60	1.00	0.33	0.39	0.40	0.42	0.43
63	0.95	0.32	0.38	0.39	0.41	0.42
67	0.90	0.31	0.37	0.38	0.40	0.41
71	0.85	0.31	0.36	0.37	0.38	0.41
75	0.80	0.30	0.35	0.36	0.38	0.39
80	0.75	0.29	0.34	0.35	0.37	0.38
86	0.70	0.28	0.33	0.34	0.36	0.37
93	0.65	0.28	0.32	0.33	0.35	0.36
100	0.60	0.27	0.31	0.32	0.34	0.35
109	0.55	0.26	0.30	0.31	0.33	0.33
120	0.50	0.25	0.28	0.29	0.31	0.32
133	0.45	0.24	0.27	0.28	0.29	0.30
150	0.40	0.23	0.25	0.26	0.28	0.28
172	0.35	0.22	0.23	0.24	0.26	0.26

REFERENCES

1 Lepeschkin E Modern Electrocardiography vol 1 The P Q-R S-T U Complex Baltimore Williams & Wilkins Co 1951

2 Ashman R and Hull E Essentials of Electrocardiography 2nd ed N Y Macmillan Company 1941

SQUARE ROOT TABLE FOR CORRECTING Q T INTERVAL FOR HEART RATE

Bazett Formula $Q\,T_c = \dfrac{Q\,T\ (\text{seconds})}{\sqrt{R\,R\ (\text{seconds})}}$

(Intervals)

R R	$\sqrt{RR}$	R R	$\sqrt{RR}$	R R	$\sqrt{RR}$	R R	$\sqrt{RR}$
0 40	0 63	0 61	0 78	0 83	0 91	1 04	1 01
41	64	62	78	84	91	1 05	1 02
42	64	63	79	85	92	1 06	1 02
43	65	64	80	86	92	1 07	1 03
44	66	65	80	87	93	1 08	1 03
45	67	66	81	88	93	1 09	1 04
46	67	67	81	89	94	1 10	1 04
47	68	68	82	90	94	1 11	1 05
48	69	69	83	91	95	1 12	1 05
49	70	70	83	92	95	1 13	1 06
50	70	71	84	93	96	1 14	1 06
51	71	73	85	95	97	1 16	1 07
52	72	74	86	96	97	1 17	1 08
53	72	75	86	97	98	1 18	1 08
54	73	76	87	98	98	1 19	1 09
55	74	77	87	99	99	1 20	1 09
56	74	78	88	1 00	1 00	1 21	1 10
57	75	79	88	1 00	1 00	1 22	1 10
58	76	80	89	1 10	1 00	1 23	1 10
59	76	81	90	1 02	1 00	1 24	1 11
60	77	82	90	1 03	1 01		

NORMAL VALUES OF CORRECTED Q T INTERVALS FOR VARIOUS AGES

Age	# Cases	Mean	Range
0 — 24 hrs	32	0 42	0 37 to 0 53
0 — 2 yrs	16	0 40	0 37 0 42
2 — 4	16	0 40	0 38 0 42
8 — 10	16	0 41	0 39 0 42
11 — 14	15	0 41	0 40 0 42
Adults	48	0 38	0 35 0 44

REFERENCES

1 Yu P N G Joos H A and Katsampes C P Unipolar electrocardiogram in normal infants and children Am Heart J 41 91 104 (Jan) 1951

2 Ziegler R F Electrocardiographic Studies in Normal Infants and Children Spring field Ill Charles C Thomas 1951

3 Winsor T Unpublished data

NORMAL VALUES FOR ELECTRIC AXES*

(Degrees)

Waves or Complexes	Mean	Range
P	51 0	0 0 to 90 0
QRS	54 0	-30 0 102 0
T	39 0	-11 0 76 0

Derived from amplitude of waves of leads I and III using tables 44 males and 35 females average age 35 years (range 15 to 50)

REFERENCES

1 Winsor T Unpublished data

LEAD I POSITIVE

LEAD III POSITIVE	0·0	0·5	1·0	1·5	2·0	2·5	3·0	3·5	4·0	4·5	5·0	6·0	7·0	8·0	9·0	10·0	11·0	12·0	13·0	14·0	15·0	20·0
0·0		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
0·5	90	60	47	44	41	39	38	37	36	35	35	34	33	33	33	32	32	32	32	32	32	31
1·0	90	71	60	53	49	46	44	42	41	40	39	38	37	36	35	35	34	34	34	33	33	32
1·5	90	76	67	60	55	52	49	47	45	44	43	41	39	38	38	37	36	36	36	35	35	33
2·0	90	79	71	65	60	56	53	51	49	47	46	44	42	41	40	39	38	38	37	37	36	35
2·5	90	81	74	68	64	60	57	54	52	51	49	47	45	43	42	41	40	39	39	38	38	36
3·0	90	82	76	71	67	63	60	57	55	53	52	49	47	45	44	43	42	41	40	39	39	37
3·5	90	83	78	73	69	66	63	60	58	56	54	51	49	47	46	44	43	42	42	41	40	38
4·0	90	84	79	75	71	68	65	62	60	58	56	53	51	49	47	46	45	44	43	42	42	39
4·5	90	85	80	76	73	69	67	64	62	60	58	55	53	51	49	48	47	45	44	43	43	40
5·0	90	85	81	77	74	71	68	66	64	62	60	57	55	52	51	49	48	47	46	45	44	41
6·0	90	86	82	79	76	73	71	69	67	65	63	60	57	55	53	52	50	49	48	47	46	43
7·0	90	87	83	81	78	75	73	71	69	67	65	63	60	58	56	54	53	51	50	49	48	44
8·0	90	87	84	82	79	77	75	73	71	69	68	65	62	60	58	56	55	53	52	51	50	46
9·0	90	87	85	82	80	78	76	74	73	71	69	67	64	62	60	58	57	55	54	53	52	48
10·0	90	88	85	83	81	79	77	76	74	72	71	68	66	64	62	60	58	57	56	54	53	49
11·0	90	88	86	84	82	80	78	77	75	73	72	70	67	65	63	62	60	59	57	56	55	50
12·0	90	88	86	84	82	81	79	78	76	75	73	71	69	67	65	63	61	60	59	57	56	52
13·0	90	88	86	84	83	81	80	78	77	76	74	72	70	68	66	64	63	61	60	59	58	53
14·0	90	88	87	85	83	82	80	79	78	77	75	73	71	69	67	66	64	63	61	60	59	55
15·0	90	88	87	85	84	82	81	80	78	77	76	74	72	70	68	67	65	64	62	61	60	55
20·0	90	89	88	87	85	84	83	82	81	80	79	77	76	74	72	71	70	68	67	65	65	60

LEAD I POSITIVE

LEAD III NEGATIVE	0·0	0·5	1·0	1·5	2·0	2·5	3·0	3·5	4·0	4·5	5·0	6·0	7·0	8·0	9·0	10·0	11·0	12·0	13·0	14·0	15·0	20·0
0·0		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
0·5	90	30	0	11	16	19	21	22	23	24	25	26	26	27	27	27	28	28	28	28	28	29
1·0	90	60	30	11	0	7	11	14	16	18	19	21	22	23	24	25	25	26	26	26	27	27
1·5	90	71	-49	30	16	7	0	5	7	11	13	16	18	20	21	22	23	23	24	24	25	26
2·0	90	76	60	44	30	19	11	5	0	4	7	11	14	16	18	19	20	21	22	22	23	25
2·5	90	79	67	53	41	30	21	14	8	4	0	6	9	12	14	16	17	19	20	20	21	23
3·0	90	81	71	60	-49	39	30	22	16	11	7	0	5	8	11	13	15	16	17	18	19	22
3·5	90	82	74	65	55	46	38	30	23	18	13	6	0	4	7	10	12	14	15	16	17	21
4·0	90	83	76	68	60	52	44	37	30	24	19	11	5	0	4	7	9	11	13	14	15	19
4·5	90	84	78	71	64	56	49	-42	36	30	25	16	9	4	0	3	6	8	10	12	13	18
5·0	90	85	79	73	67	60	53	-47	41	35	30	21	14	8	4	0	3	6	8	9	11	16
6·0	90	86	81	76	71	66	60	54	49	-44	39	30	22	16	11	7	3	0	3	5	7	13
7·0	90	86	82	78	74	69	65	60	55	51	46	38	30	23	18	13	9	6	3	0	2	10
8·0	90	87	83	80	76	72	68	64	60	56	52	44	37	30	24	19	15	11	8	5	2	7
9·0	90	87	84	81	78	74	71	67	64	60	56	49	-42	36	30	25	20	16	13	9	7	3
10·0	90	87	85	82	79	76	73	70	67	63	60	53	-47	41	35	30	25	21	17	14	11	0
11·0	90	88	85	83	80	77	75	72	69	66	63	57	51	-45	-40	35	30	26	22	18	15	3
12·0	90	88	86	83	81	79	76	74	71	68	66	60	54	49	-44	39	34	30	26	22	19	7
13·0	90	88	86	84	82	80	77	75	73	70	68	63	57	52	-47	43	38	34	30	26	23	10
14·0	90	88	86	84	82	80	78	76	74	72	69	65	60	55	51	46	42	38	34	30	27	13
15·0	90	88	87	85	83	82	79	77	75	73	71	67	62	58	53	-49	45	-41	37	33	30	16
20·0	90	89	87	86	85	83	82	81	79	78	76	73	70	-67	63	60	57	53	50	-47	-44	30

REFERENCES

1 Jackson C E and Winsor T Aids for determining magnitude and direction of electric axes of the electrocardiogram Circulation 1 975 981 (April) 1950

LEAD I NEGATIVE

LEAD III NEGATIVE	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	20.0
0.0	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
0.5	90	120	131	136	139	141	142	143	144	145	145	146	147	147	147	148	148	148	148	148	148	149
1.0	90	109	120	127	131	134	136	138	139	140	141	142	143	144	145	145	146	146	146	147	147	148
1.5	90	104	113	120	125	128	131	133	135	136	137	139	141	142	142	143	144	144	144	145	145	147
2.0	90	101	109	115	120	124	127	129	131	133	134	136	138	139	140	141	142	142	143	143	144	145
2.5	90	99	106	112	116	120	123	126	128	129	131	133	135	137	138	139	140	141	141	142	142	144
3.0	90	98	104	109	113	117	120	123	125	127	128	131	133	135	136	137	138	139	140	141	141	143
3.5	90	97	102	107	111	114	117	120	122	124	124	129	131	133	134	136	137	138	138	139	140	142
4.0	90	96	101	105	109	112	115	118	120	122	124	127	129	131	133	134	135	136	137	138	138	141
4.5	90	--95	100	104	107	111	113	116	118	120	122	125	127	129	131	132	133	135	136	137	137	140
5.0	90	95	99	103	106	109	112	114	116	118	120	123	125	128	129	131	132	133	134	135	136	139
6.0	90	94	98	101	104	107	109	111	113	115	117	120	123	125	127	128	130	131	132	133	134	137
7.0	90	93	97	99	102	105	107	109	111	113	115	117	120	122	124	126	127	129	130	131	132	136
8.0	90	93	96	98	101	103	105	107	109	111	112	115	118	120	122	124	125	127	128	129	130	134
9.0	90	93	95	98	100	102	104	106	107	109	111	113	116	118	120	122	123	125	126	127	128	132
10.0	90	92	95	97	99	101	103	104	106	108	109	112	114	116	118	120	122	123	124	126	127	131
11.0	90	92	94	96	98	100	102	103	105	107	108	110	113	115	117	118	120	121	123	124	125	130
12.0	0	92	94	96	98	99	101	102	104	105	107	109	111	113	115	117	119	120	121	123	124	128
13.0	90	92	94	96	97	99	100	102	103	104	106	108	110	112	114	116	117	119	120	121	122	127
14.0	90	92	93	95	97	98	100	101	102	103	105	107	109	111	113	114	116	117	119	120	121	125
15.0	90	92	93	95	96	98	99	100	102	103	104	106	108	110	112	113	115	116	118	119	120	125
20.0	90	91	92	93	95	96	97	98	99	100	101	103	104	106	108	109	110	112	113	-115	115	120

LEAD I NEGATIVE

LEAD III POSITIVE	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	20.0
0.0		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
0.5	90	150	180	169	164	161	159	158	157	156	155	154	154	153	153	153	152	152	152	152	152	151
1.0	90	120	150	169	180	173	169	166	164	162	161	159	158	157	156	155	155	154	154	154	153	153
1.5	90	109	131	150	164	173	180	175	172	169	167	164	162	160	159	158	157	157	156	156	155	154
2.0	90	104	120	136	150	161	169	175	180	176	173	169	166	164	162	161	160	159	158	158	157	155
2.5	90	101	113	127	139	150	159	166	172	176	180	174	171	168	166	164	163	161	160	160	159	157
3.0	90	99	109	120	131	141	150	158	164	169	173	180	175	172	169	167	165	164	163	162	161	158
3.5	90	98	106	115	125	134	142	150	157	162	167	174	180	176	173	170	168	166	165	164	163	159
4.0	90	97	104	112	120	128	136	143	150	156	161	169	175	180	176	173	171	169	167	166	165	161
4.5	90	96	102	109	116	124	131	138	144	150	155	164	171	176	180	177	174	172	170	168	167	162
5.0	90	95	101	107	113	120	127	133	139	145	150	159	166	172	176	180	177	174	172	171	169	164
6.0	90	94	99	104	109	114	120	126	131	136	141	150	158	164	169	173	177	180	177	175	173	167
7.0	90	94	98	102	106	111	115	120	125	129	134	142	150	157	162	167	171	174	177	180	178	170
8.0	90	93	97	100	104	108	112	116	120	124	128	136	143	150	156	161	165	169	172	175	178	173
9.0	90	93	96	99	102	106	109	113	116	120	124	131	138	144	150	155	160	164	167	171	173	177
10.0	90	93	95	98	101	104	107	110	113	117	120	127	133	139	145	150	155	159	163	166	169	180
11.0	90	92	95	97	100	103	105	108	111	114	117	123	129	135	140	145	150	154	158	162	165	177
12.0	90	92	94	97	99	101	104	106	109	112	114	120	126	131	136	141	146	150	154	158	161	173
13.0	90	92	94	96	98	100	103	105	107	110	112	117	123	128	133	137	142	146	150	154	157	170
14.0	90	92	94	96	98	100	102	104	106	108	111	115	120	125	129	134	138	142	146	150	153	167
15.0	90	92	93	95	97	99	101	103	105	107	109	113	118	122	127	131	135	139	143	147	150	164
20.0	90	91	93	94	95	97	98	99	101	102	104	107	110	113	117	120	123	127	130	133	136	150

REFERENCES

1 Jackson C E and Winsor T Aids for determining magnitude and direction of electric axes of the electrocardiogram Circulation 1 975 981 (April) 1950

PART D

INDEX

INDEX

This Index includes only electrocardiographic findings and interpretations found in Electrocardio-
ams Part A Volume I (Pages 1 119) and answers to Questions on Electrocardiograms Part B
olume II (Pages 1 119) Page numbers in the Index apply to *both* correspondingly numbered pages
Volume I and Volume II

Questions and Answers on Electrocardiographic Interpretation are *not* indexed but are listed in
ppropriate categories in the Table of Contents in both Volume I and Volume II

Tables of normal values found in the Appendix Part C Volume I are included in the Index

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